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THE BASIS

OF

PASSIONAL PSYCHOLOGY

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№ 16.

THE BASIS
OF
PASSIONAL PSYCHOLOGY

A STUDY OF THE LAWS OF LOVE IN MAN
AND THE LOWER ANIMALS

BY

DR. JACOBUS X***
FRENCH ARMY-SURGEON

Author of: Untrodden Fields of Anthropology; The Ethnology of the Sixth Sense; Genital Laws; Medico-Legal Examination of the Abuses, Perversions and Dementia of the Genital Faculty; also Several Works on Military Science;

Officier de la Legion d'honneur; Officier de l'instruction publique; etc., etc.

VOLUME I

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GENERAL INTRODUCTION.

We now proceed to lay before the reader the natural sequel to our three previous works: "The Abuses and Aberrations of the Sexual Instinct;" "The Ethnology of the Sixth Sense;" and "Genital Laws, their Observance and Violation;" it forms their logical completion and requires a prior study of their contents in order to be understood.

In fact, the ultimate aim of our work on the "Sixth Sense" is the study of the Physical and Moral Mechanism of Love in the Human Species, as forming the "Basis of Passional Psychology." We shall show that Love is a twofold product of the genital system and of the human brain. We shall therefore make a study of the reciprocal influence of these two fundamental factors of Love; this will enable us to understand the double error committed by those who have studied Love only from its physical side, and by those who have studied it only from its mental side. It is on this account that priests and physicians have never agreed upon this subject, and that Apollo's lyre has never been in harmony with Vésale's lancet.

The reader will now understand why, in the first works of this series, we laid the foundations of the temple of Love as a medical rather than as a purely philosophical study. In this latter portion, which may be considered as the crowning part of the edifice, we have laid widely under contribution not only the works of Medico-Philosophers, (the number of whom is great), and of learned Naturalists, but also those of the Thinkers, Writers, and even of the Poets of both sexes. The work, therefore, which we lay before the reader is, according to our usual custom, of an eclectic nature: we give him our deliberately-formed conclusions and opinions, without seeking to impose them upon him.

Another word! The Anatomy, Physiology and Psychopathy of the "Sixth Sense" have been studied in a general though detailed manner as regards the two Sexes. We have thought it necessary, in this our latest work, to resume the question in part, and to study the Physiology and Psychology of Woman specially in comparison with the same study in the case of Man.

Without this previous investigation it would be excessively difficult, not to say impossible, to understand the general Psychology of Love which, as we shall observe, differentiates completely in the two Sexes. Each of them loves *normally* in a manner as differently as the physical act of love is performed.

Again, as the Woman is the *pivot* of the passions of Love, it is right for us to seek in her for the key of the Love-Passion, the Love which clearly divides Mankind, (I refer to both Sexes), from the Beast. It is Woman *alone* who has created the Love-Passion which distinguishes her from the Female Animal. If, by the laws of Physiology, she is bound by the same fetters as regards her genital life as the Female Animal, if she possesses the same physical desires and has the same pains to endure; through her Love-Passion she is able gradually to subdue Physical Love and, in the great majority of cases, to lay it low at her feet. Mind has overcome matter, the heart has subdued the womb. This is an interesting fact to note, especially at the present day when Feminism has declared war against the Male and loudly demanded Equality between the two sexes.

GENERAL PLAN OF THE WORK.

This is clearly marked out. The Physiology of Woman must be studied concurrently with physical love. This will be the subject of one part of our volume. On the other hand, Feminine Psychology will afford us the Key to the Love-Passion, a point upon which we cannot too strongly insist. This will be the thread of Ariane which will serve to guide us in the labyrinth of the human heart. This will supply us with the materials for the Second Part, consisting, like the first, of several hundred pages.

We shall in this way give the reader the fruit of an impartial study, undertaken in an unbiassed spirit, of hundreds of different volumes, referring more or less to the subject of Love; a work of Eclecticism, as I prefer to call it, — a work of compilation, if you will. But the subject-matter is so ample, so vast; Love has from all time been so extolled, so praised, so sung sometimes too, so abused, ever since the time man learned to compose songs and write poems, that it would have been in the highest degree presumptuous on our part to have any pretensions to write a serious and above all a scientific work, without referring to the works of our predecessors.

Go forth then, children of my old age, and may the public receive you with the same kindly welcome which has been bestowed upon your elder brethren.

DR. JACOBUS X***

MEUDON, November, 1900.

THE BASIS
OF
PASSIONAL PSYCHOLOGY

SELECTED THOUGHTS AND MAXIMS

"And now, putting aside books and speaking more naturally and simply, I find, after all, that Love is nothing else but the thirst for this enjoyment in a desired object, and Venus nothing else but pleasure."

Montaigne.

"In Love, the physical portion is the only good."

Buffon.

"It is not necessary to be too much loved in order to be respected. Love and veneration do not proceed together."

Madame de Puissieux.

"Carnal Love is a fever and a furious passion and very dangerous to him who allows himself to be carried away by it, for what happens to him? He no longer belongs to himself; his body will undergo a thousand labours in order to find pleasure, and his mind a thousand torments in order to assist his desire; his desire as it increases becomes a frenzy. In one action it makes wise men and fools, men and beasts, equal and alike; it abases and brutalizes all wisdom, resolution, prudence, contemplation, and every operation of the soul.

"By this Alexander the Great knew that he was mortal, as well as by sleep, for both suppress the faculties of the soul."

Charron.

PREFACE

TO

THE BASIS

OF

PASSIONAL PSYCHOLOGY.

The number of authors who have written on the subject of Love is legion and, confining ourselves to Physical Love only, we might write a whole volume filled merely with quotations. But this would lead us into an absolute labyrinth, and the only result would be to weary the reader to no purpose, and produce a work as solid as it would be heavy and indigestible. We shall therefore remain content with giving the quotations above.

Let us now proceed by analysis and take the Love-Passion which idealizes the Human Creature and which is distinct from physical Love, as we have remarked a few lines before. Be it so. But where lies the exact boundary between these two loves? He who could give an answer to this question could also indicate the point which separates soul and body, God and the world.

Physical Love, on the other hand, of the human race is identical with that of animals. It is, consequently, the natural course to take up the matter *ab ovo*, from the lowest step on the ladder of animal life, starting from the modest infusoria and ending with the King of the terrestial creation, to use the pompous designation of the philosophers of the 18th century.

When we have reached the last stage, that of man, our logical course, in accordance with what we have stated in our General Introduction, would be to apply ourselves to the particular study of the physiology of Woman before entering upon the study properly so called of Physical Love in the Human Species; but, as we proceed, we shall readily observe that in this aspect Woman is but a perfected female and that what we have to say with regard to Physical Love in the superior animal series applies equally well to the woman of Terra del Fuego and to the Parisienne.

Upon this account and also to retain the unity of our line of thought, we have devoted an appendix at the end of the Volume to the study of the Physiology.

The reader will have merely to refer to it from time to time as our work proceeds.

DR. JACOBUS.

THE BASIS
OF
PASSIONAL PSYCHOLOGY.

OF LOVE.

CHAPTER I.

What is Love in the Human Race?

Rapid survey of the historical progress of Love in the Human Race.—The song of the Lover and the Maid in the East.—Love according to the Bible and to the Song of Songs of Solomon.—Love according to Mahomet.—Love according to Christ.—Platonic love according to the poet.—The first Love of Adam and Eve. 1

CHAPTER II.

Life and Love of the Earth.

Power of Love.—Life and Love on the Earth.—Universal Generation is a Law of the Universe.—Creative force of Nature.—Love is the Chief Function of Man.—Mysteries of Love in Nature.—What is the Origin of Man and in what way must we study it? 16

CHAPTER III.

Mineral Matter and Vegetable Life. Their Intimate Dependence.

Immense progress of natural Science since the middle of the Century.—The Creation of Organized matter.—Mineral matter is the basis of the

Creation of Organized Beings.—Appearance of Organized Life on the Earth.—What is a Plant?—The progressive evolution of Creatures in the Fundamental Law of Nature.—Circulus of the Metamophoses of Matter.—*Memento homo quia pulvis es et in pulverem reverteris.* 31

CHAPTER IV.

The Origin and the Secret of Life?

Where does Life begin and where does it end? Where does Death begin and where does it end?—The Secret of Life.—The Microzyma is the Vital Unity.—Unity of the Principle of Life in all Organized Beings.—The Microzyma is the Beginning and the End of every Organism.—Folly of Criticisms directed against the Microzyma considered as the Vital Unity.—The Microzyma exists everywhere in Nature.—Life and Death are only Modes of Transformation.—Universal Biology.—Evolutions of Microzymas in Cellules or in Bacteria.—The Great Law of the Natural Evolution of Organized Beings.—Experiments show the action of the Microzyma upon pure mineral matter and upon Organized matter.—The Microzyma explains the Great Laws of Evolution, Heredity and Natural Selection.—Reproduction of Béchamp's experiments by Foreign Scientists.—The Microzyma is the Key of Modern Science with regard to the Origin of Organic Life. 39

CHAPTER V.

Animal Life.

The Method to follow.—Animal Life and its First Manifestations.—General Characteristics of the Animal Kingdom.—Natural Classification of Animals.—Absolute concordance of Three Kingdoms. 65

CHAPTER VI.

Man's Place in the Animal Kingdom.

How ought Man to be studied?—Man's Place in Nature.—Parallel between Men and Animals, from the Anthropological Point of View.—Man is a Primate.—Classification of different Scientists.—Comparison of Primates with other Animals.—Man's Place in the Classification.—His Origin, is it Single or Multiple?—His Genealogy.—His Future.—Summing-up and Conclusion. 74

CHAPTER VII.

Soul and Matter.

What is the Nature of the Difference which separates Man from Beast?—Soul and Matter according to the Materialist School.—Beast and Man.—Man is the only Creature possessing Reason.—Man has the Power of Speech; he is free; he is the Master of Nature.—Animals do not possess Reason.—Animals have no Morality.—Man invents, Animals are unable to do so.—Animals do not speak.—Versatility of Human Language.—Animals are incapable of attaining Reason.—Philosophers and Physicians.—Spiritualists.—Definition of the Human Soul according to its proper and distinct Characteristics.—Natural Deontology.—The Soul of Animals.—The Materialist School.—The Evolution of the Moral Idea, by Dr. Letourneau. 87

CHAPTER VIII.

The Moral and Social Evolution of the Human Race Proved by Living Prehistory.

The History of Civilizations.—The Doctrine of Evolution ought to be applied to it.—Summary of Prehistory.—Its different Phases.—The prehistorical Period belongs to the Neolithic age.—The Lake-dwellings of Historical Times.—Analogy between Prehistorical Industry and Habits, and those of Contemporary Savages.—Anatomical Analogy between Prehistorical Races and Savages of the present Day.—Contemporary Prehistory.—It throws a Light upon past Prehistorical Periods and the Social Evolution of the Human Race.—Evolutive Psychology. 117

CHAPTER IX.

The Origins of Moral Inclinations.

(I).—The Impregnation of the Nervous Cellules.—Luminous and nervous phosphorescence.—Memory of Nervous Cells.—Motive Associatons registered.—Diderot and Free Will.

(II).—Instincts in Animals.—Functions and Instinct.—Organic Predestination.—Acquired Instincts.—Obliterated Instincts.—Training of Dogs.—Moral Conflicts in the Dog.—Man-eating Bloodhounds.—Deadened ferocious Instincts.—Heredity of Acquired Instincts.—General Formulæ. 127

CHAPTER X.

The Origin of Moral Inclinations. (*Continued*).

(I).—The Moral Feelings in Animals: The Human Kingdom.—Morality arises from the Social State.—Animal Psychology and Human Psychology.—Maternal Love in Animals and in Man.—Filial Love in a Elephant.—Altruism in Animals.—Great Qualities and Small Defects.—Despotism among Monkeys.—High Morality of Ants

and Bees.—Diversity of the Moral Feelings in Ants.—Influence of Public Opinion, among Ants.—Criminal Bees.

(II).—How is Human Morality formed? Immoral hereditary Tendencies in Man.—Absence of Remorse in Certain Animals.—Genesis of the Consience.—Unwritten Laws.—Relativity of the Moral Feelings.—The non-existence of the Soul, according to Roux, author of "*La Psychologie de l'Instinct sexuel.*"—Conclusions by Dr. Jacobus. . 144

CHAPTER XI.

The Sexual Want, its Organic Foundation, Origin and Associations with Other Wants.

The Study of the Love of Animals must precede the Study of Human Love.—General Processus of the Generation of Organized Beings.

(I).—The Sexual Want.—Organic.—Foundation of the Sexual Want.

(1). Origin of the Sexual Want not in the Centres, but in the Periphery.

(2). Ought the Origin of the Sexual Want to be placed in the Sensations which proceed from the Genital Organs?
Chronological Relations between the Development of the Sexual Instinct and the Development of the Genital Organs.—Castration in Animals.—Castration in Man.—Castration in the Adult Woman.—The Menopause.—After-satisfaction of the Sexual Want.

(3). The Sexual Want has its Origin in every Organism.—Comparison of the Sexual Instinct to Hunger.—Distinction between Sexual Hunger and the Sexual Appetite.—Psychology compared.

(4). The causal Excitant of the Sexual Want is analogous to the Causal Excitant of the Nutritive Want.

(II.)—The Organic Sexual Want.

(1). Sexual Centres.

(2). Conscious sensation.—Affective Condition.

(3). Associations of the Sexual Want with other Sensations.

(A).—Associations of the Sexual Want and the Genital Sensations.

(B).—Association of the Sexual Want and the Olfactory Sensations.

(C).—Associations of the Sexual Want and the Visual Sensations.

(D).—Associations of the Sexual Want and the Auditory Sensations.

(E).—Associations of the Sexual Want and the Tactile Sensactions.

(F).—Associations of the Sexual Want and the Gustatory Sensations. Influence of the Senses upon Pleasures. On Love according to the Senses in Modern Litterature. 167

CHAPTER XII.

Physical Love in Animals.

Physical Love.—Choice.—*Modus faciendi* of the Accouplement in Thalamic Animals.—Periodicity of the Sexual Instinct or of Rut.—General Rules of Rut in Animals. 221

CHAPTER XIII.

The Forms of Accouplement and Generation in Animals.

(I.) — Cold-Blooded animals. — Polypi. — Worms.—Leeches.—Crustaceans.—Insects.—Serpents.—Eels.—Tortoises.—Lizards.—Frogs.—Toads. — Oviparous Fishes and Viviparous Fishes.—Fecundity of Fish.

(II).—Cetaceans.—The Coition of two Whales.—Dolphins.—Spermaceti-Whales.—Walruses.—Seals. 236

CHAPTER XIV.

Forms of Accouplement and Generation among Animals.

(*Continued*).

The Loves of Birds, according to Toussenel.—Monogamy and Polygamy of Birds.—The Poetry of the Loves of Birds.—The Chaffinch, the Green Linnet, the Sparrow, the Redbreast, the Warbler, the Oriole, the Lark, the Starling, the Canary, the Jackdaw, the Cuckoo. Partridges, the Quail, Pigeons, Turtledoves. 256

CHAPTER XV.

Forms of Accouplement and Generation in Animals.

(*Continued*).

Generalities on the Accouplement of Mammifers.—Effects of Rut upon the Sexual Organs.—Duration of Gestation.—Number of Young.—Number of Teats.—Lactation.—Vivacity of Love in Mammifers.—Forms of Love in Horses.—Asses.—Cows.—Goats.—Roe-deer.—Fallow-deer.—Dogs.—Foxes.—Badgers.—Philander of Surinam.—Squirrels.—Beavers.—Otters. — Moles.—Cats.—Tigers.—Lions.—Bears.—Elephants.—Rhinoceros.—Hippopotami.—Camels.—Sows.—Hares.—Rabbits. 274

CHAPTER XVI.

The Pleasures of the Accouplement of Animals Compared to that of Man.

Is the Pleasure of Accouplement in Animals of the same nature as that in Man?—The Pleasures of Love in the Animal Series.—Molluscs.—Androgynes.—The Love of Gasteropodes.—The Accouplement of Snails.—Insects, — Fishes, — Batracians,—Snakes and Lizards, — Birds, — Mammifers.—The Apologue of the Stallion and the Ass, by Rabelais.—Lasciviousness of Monkeys.—Reasons for the Lasciviousness of Monkeys.—Baboons.—Ourang-Outangs.—Maternal Care of Monkeys.—Their Coition.—Modesty of the Females of the Ourang-Outang.—Negresses violated by Gorillas.—Immodesty of the Females of the Baboon. 300

THE BASIS
OF
PASSIONAL PSYCHOLOGY.

CHAPTER I.

WHAT IS LOVE IN THE HUMAN RACE?

Rapid Survey of the historical progress of Love in the Human Race:—The Song of the Lover and the Maid in the East.—Love according to the Bible and to the Song of Songs of Solomon.—Love according to Mahomet.—Love according to Christ.—Platonic Love according to the Poets.—The First Love of Adam and Eve.

Rapid Survey of the Progress of Love in the Human Race. This has been given to us by the sweet singer Virgil. At the beginning of the world, love was not a passion but merely a general law of Creation. "The chaste heavens become enamoured of the earth, and the earth lays itself out for its embraces. Then the rain falls from heaven as from the breast of a spouse, and kisses the earth which brings forth in emulation, grass for the flocks and corn, food for man. This nuptial dew gives strength and verdure to the trees." (1)

This was the first period of love, its fœtus, or embryo, if we may so express it.

In the next period, the child is born; it becomes an instinct and at the same time a want of nature. But how rude and barbarous it still is! Our prehistorical ancestor dwelling in caves, the possession of which he was obliged to dispute with the bears, had no time to whisper words of love to his female companion. He had to struggle for his existence, and this struggle was a terrible one. Of all that belongs to love, he scarce knew aught else save the act of reproduction. When he had once retired to his den and satisfied his hunger with the flesh of the animals he had slain in the chase, "seized with desire for the sexual union, he would cast aside the cloak of fur which covered him, lay bare his shaggy skin and throw himself with cries of pleasure upon his female companion who awaited the attack, quivering with terror and alarm." (1)

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(1) Virgil, *The Georgics.*

In the following period, Love advanced together with mankind. Love is a child, as it was represented by the Greeks. He is as fair as the day and weak though he may seem, his power is already formidable. Real and true Love now exists.

"In presence of a pacified world, master of the elements now less troubled, man, already refined by a primitive civilisation, could repose and took around him," says Dr. Laurent. "He saw Nature budding with all the beauty of spring, its half-opened flowers, its mountains with their mighty, swelling summits, its streams with their headlong, thundering waters, its seas with their mighty waves, its sun with its golden rays, and above all the infinite light giving life and power and beauty. He loved what surprised and astonished him in Nature surrounding him; and drawn towards the woman by the tie of reproduction and of conservation of the species, he was pleased to endow her with the brilliant qualities which he had met with in other beings." (2)

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(1) G. Saint Yves, *La Littérature Amoureuse*, Marpon et Flammarion, Paris, 1887.

(2) Dr. Emile Laurent, *L'Amour Morbide*, Sté. d'Editions Scientifiques, Paris.

And so at this period, "Love became a sentiment as well as a want. For this sentiment does not proceed without the carnal satisfactions, without the coming together of the two sexes in a kiss of the genital mucous membranes. This is real and simple love, such as it was understood by the ancients; this is what I shall call *perfect or harmonic love.*" (¹)

We have seen above that the poets of antiquity have left us magnificent pictures of this perfect Love.

They have been even surpassed by the poets and writers of India, that mother of European civilisation which has come to us thence through Egypt and ancient Greece.

Let us listen to the love song which the learned Indianist, Jacolliot, has given to us in one of his works. (²)

A Love Song from India. "Throughout Hindostan, no orgie of love is ever commenced without the recitation of this voluptuous song after an invocation of the Dawn and of the Sun: the two personages in the Hindoo Pantheon whose office it is to lavish on mortals all good, all wealth and all fortune.

"The young and lovely Nourmah complied with this custom.

"To this invocation succeeded a love song sustained by two voices. A second dancing-girl appeared; her office it was, disguised as a youth, to reply to Nourmah in alternate strains.

"Nourmah commenced the song.

MAIDEN.

Oh! my loved one, I know not what fire consumes me, my mouth is parched, my heart is throbbing. What is this ill for which I know no cure? The star of night whose rays should give my soul repose by heralding the advent of him for whom I wait, has not yet risen .... Unhappy that I am, he for whom my heart is watching, whom my lips desire, from

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(¹) G. Saint Yves, *loc. cit.*
(²) *Voyage au Pays du Haschich*, Paris, Dentu, 1883.

whom my parched bosom longs to receive life, will not come.

I said to myself: I will tread the lotus-bordered path.... But alas! I have found there the serpent of love and his cruel tooth. Can it be that the moon's rays, so cold by nature and so sweet to mortals, have lit the fire which consumes me within?

The night-breeze, cool, and heavy with the scent of flowers, seems to me now like a scorching flame. He alone occupies all my thoughts and I have no will but his. He fills my whole being, and my soul is bereft of energy and strength.

I tremble and am distraught; my sight fails me and I feel as though about to die.

THE LOVER.

Sweet one, I am here, and scarcely yet does the moon, whose shining orb should be the signal of my coming, begin to show herself. And see, yon fair planet whose brightness is revealed in thy dear face, now is veiled by clouds, like thy face when shaded with the tresses of thy hair. Her disc stands forth like a bow in the heavens and resembles the gleaming gold which decks thy neck.

The streams of water which fall from the clouds are as slender and graceful as thy limbs.

On the dark background of the clouds a long line of swans advances rivalled in whiteness by thy dazzling teeth.

THE MAID.

Oh! light of my life, speak on, speak on; the sound of thy voice is as welcome to my heart as cooling showers to a sun-dried land.

THE LOVER.

I thirst for thy kisses; let me lay my lips on thine which are as fresh and ruddy as the pomegranate.

THE MAID.

Ah! I die within thine arms.

THE LOVER.

Let me press they lovely breasts, firm as the golden apples in the garden of Cama and sweet to smell as the jasmine-flower.

THE MAID.

I am thine, oh my loved one; in thy embrace, mine eyes are lost in vacancy and life begins to leave me; oh, holy Goddess, Lakmé, Mother of Love, does one feel such pleasure in dying of love?

THE LOVER.

No, thou wilt not die; 'tis life which in long waves surges into thine entrails athirst for pleasure.

THE MAID.

Oh! oh! oh! my loved one!

THE LOVER.

Still let me embrace thee.

THE MAID.

I am one with thee; ah! press me tighter in thine arms and let an amorous embrace unite us like the tree and the bark.

THE LOVER.

I fear lest I may hurt thy fair breasts or bruise thy delicate limbs.

THE MAID.

Have no fear.... go on, my lion, let me feel thy vigour, pierce me as the huntsman pierces with his arrow the heart of the faithful hind in the thickets.... pain gives still a greater zest to pleasure.

THE LOVER.

Oh! joy divine! And I am the first to roll thy sweet body on a bed of dried leaves....

THE MAID.

Kill me, come, kill me by pleasure, kill me by love, kill me by joy.

THE LOVER.

Nay, rather live, in order that we may repeat these hours of maddest passion.

THE MAID.

Oh! kill me rather than forget me.

THE LOVER.

Forget thee! forget thee! ah! read in mine eyes the wild pleasure which thou givest me.

THE MAID.

Ah! what is this strange quivering...?

THE LOVER.

'Tis the pleasure of love.

THE MAID.

Oh! mine eyes no longer see the light....

THE LOVER.

'Tis the pleasure of love.

THE MAID.

My head swims, my lips grow cold.... Cama, mighty God, help me! I am dying.

THE LOVER.

No! for a new life begins to circulate in thy womb.

THE MAID.

Where am I, ye Gods?

THE LOVER.

Fear naught, for I am near thee.

THE MAID.

I am afraid.

THE LOVER.

What canst thou dread within thy lover's arms?

THE MAID.

Ah, I remember.... thy kisses burn me still; leave me not.

THE LOVER.

I watch over thee as a mother watches over her child.

THE MAID.

The horrid Pisatchas may play me some evil trick.

THE LOVER.

They can do naught to thee here upon my heart.

THE MAID.

Sing to me, my loved one, for the sound of thy voice gives me confidence.

THE LOVER.

'Tis the season the most propitious for love, the leaves are fallen into the pools and cover the waters once so bright and limpid and now dulled by the streams; these clouds, driven by the wind and on which the moonlight plays, clash together in the air like elephants fighting in the forest with their dazzling tusks.

THE MAID.

And it is the strongest which o'ercomes the others in the forest glade. And so thou hast made me yield to thee on this bed of dried leaves.

THE LOVER.

I have won thee by love, not overcoming thee by force.

THE MAID.

Yet believe me, my loved one, that love too is willing to find itself tamed and subdued by force.

THE LOVER.

I know of no time more propitious for love than this stormy season which so often sees the seven-coloured bow appearing in the sky, like the sacred sign which crowns thy forehead. At sight of the stormy sky, the peacocks loudly voice their joy, uttering shrill cries and gathering together; they rear aloft their tail heavy and shapeless with the rain, and prancing beside their companions, imitate the movements of a dancer. Some, under the shelter of the terraces, stalk proudly and display the varied colours of their brilliant plumage; while others, caught by the storm on the tops of the trees, gather the treasures of their plumage beneath their moistened wings, and, their fair body all quivering, descend to the green carpet of the ground.

The rain ceases for an instant, and all around the soft fresh air is balmy with the scent of sandal and filled with the intoxicating perfumes of Eastern flowers, a delicious air which dries the sweat of pleasure on our limbs and foretells a fresh fall of rain to follow. What would autumn be, deprived of this beneficent breeze? No, there is nothing to be preferred to this perfumed wind which comes to disturb the calm of our intercourse, and, after the sweet fatigue of love, gently refreshes our burning limbs.

THE MAID.

Oh! sing again.

THE LOVER.

See, my sweetest, the heaven laden with clouds, like some deep lake hung above our heads whose waters threaten each instant to break their banks; see too these clouds which the moon encircles with a silvern girdle; they bring coolness to this parched earth.

Oh! how I love this season of the year, bringing in its train the thunder and the storm; it wakes fond lovers from their slumber, and compels them to seek a shelter from their fear in one another's arms, and thus doubles the transports of their love.

THE MAID.

Oh! my dearest, my sweetest, who art to my soul as the cloud to the thirsty earth, this season has one defect, for with a damp and gloomy veil it hides from our gaze that moon which shines like thy fair face. When that planet, the world's sweet torch, is revealed between the clouds, the fascinated watcher seems to see a friend come back from the far-off land. The moon is the witness of the groans of the maid separated from her lover, Oh, moon! thou charm of secret meetings, how fair thou art when the lover remains faithful and hastens to his mistress at the appointed hour; how sad and gloomy when the abandoned mistress follows thy course with her eyes, as she counts the hours which slowly pass, when the faithless lover has forgotten her whom once he loved.

THE LOVER.

My life's charm, my beloved, I swear that thou shall never count those hours, I swear that thou shall never have cause to follow with lonely eyes the course of the moon, and that thy lover shall always come before the hour of meeting.

THE MAID.

Ah! I need to hear thine oaths; swear that thou wilt never leave me.

THE LOVER.

I swear to love thee always, and may my soul take life again in the body of a vampire, whose only food is the bodies of those whom he drags from their tombs, if I ever fail to my oath.

THE MAID.

I believe thee, beloved one.

THE LOVER.

Come let us enter again this shady dell and seal our vows with fresh kisses."

Love, according to the Bible and the Song of Songs of Solomon. The poets of India had not the sole privilege of singing of love. In the Song of Songs, really a mystic and sensual song of love, the great King Solomon exalts it and displays his enthusiasm.

"The joints of thy thighs are like jewels, the work of the hands of a cunning workman.
"Thy navel is like a round goblet, which wanteth not liquor: thy belly is like a heap of wheat set about with lilies.
"Thy two breasts are like two young rocs that are twins.
"Thy neck is as a tower of ivory; thine eyes are like the fishpools in Hesbon, by the gate of Bethrabbim: thy nose is like the tower of Lebanon which looketh toward Damascus.
"Thine head is like Carmel and the hair of thine head is like purple; the king is held in the galleries.
"How fair and how pleasant art thou, O love, for delights.
"This thy stature is like to a palm tree and thy breasts to clusters of grapes.
"I said, I will go up to the palm tree, I will take hold of the boughs thereof: now also thy breasts shall be as clusters of the vine, and the smell of thy nose like apples."

The beloved comes to him with no less passion of love:

"I am my beloved's, and his desire is toward me.
"Come, my beloved, let us go forth into the field; let us lodge in the villages.
"Let us get up early to the vineyards; let us see if the vine flourish, whether the tender grape appear, and the pomegranates bud forth; there will I give thee my loves."

"Song of Songs."—*Old Testament.*

Love, according to Mahomet. The prophet Mahomet thoroughly understood this need of love, carnal the same time as immaterial, which torments the heart of every man. Therefore he has peopled his paradise with houris who ever multiply their ardour under caresses of flame, without wearying the senses, and supply eternal coition to the elect. Not only has he permitted and even glorified sensual love upon this earth, but to those who walk in the ways of Allah, he has promised: "Virgins whose brows are crowned with everlasting roses; whose eyes are brighter than our summer suns, and so sweet that a glance which falls from them intoxicates and subdues."

Love, according to Christ. Christ, on the other hand, has banished carnal love from his Paradise and rejected as shameful the ephemeral pleasures which the senses give. To his elect he has promised joys free from all material alloy. He has spoken to them of a heavenly Jerusalem where they will kneel before tabernacles perfumed with myrrh, where they will see the mystic, the Immaculates crowned with their golden crowns, and where they will hear the eternal Hosannah sung by the Cherubim on their harps of gold. They will be freed from the dominion of their senses and a ray of Love issuing from the heart of the Crucified to which all their hearts will converge like so many rays from a dazzling sun, will be sufficient to steep them in ineffable joy throughout eternity. The contemplation face to face of Jehovah, the Only One, the Most High, the eternal Beauty, will be enough to nurture that love.

Platonic Love, according to the Poets. The Greek Platonic Love (so called from the name of Plato, the Philosopher) was slightly tinged with sensuality. In reality, as we shall see, it signified the chaste love of one man for another man, and the Psycopathy of Love has shewn us the sexual tendencies of the love of Inverteds and the actual goal of abnormal coition towards which they converge.

The Poets, however, have adopted the name of

Platonic Love to indicate that ideal love which springs from the "religious theory which disdains the physical delights of love and desires to make it a sentiment absolutely detached from earth, a sentiment in which the soul alone can speak and the senses are silent."

Dr. Laurent points out to us that Platonic Love has, in fact, given birth to a poem of rare beauty and of a dignity which has never been surpassed.

One day, a child nine years of age saw in a Church at Florence a sweet and beautiful young girl, of the same age as himself. He never spoke to her, he never even told her his name, and yet his heart began to throb with love, and an immense joy took possession of his whole being. "At that moment," he says, "the spirit of life which resides in the most secret chamber of the heart began to tremble so exceedingly that it showed itself with terrible effect in my pulsations. And as it trembled, it said: *Ecce Deus fortior me qui veniens dominabitur mihi.* Forthwith the animal spirit which dwells in the lofty chamber where the sensitive spirits carry their perceptions began to be greatly amazed, and addressing itself more particularly to the spirit of life, uttered these words: *Apparuit jam beatitudo nostra.* Then the spirit of nature which resides in that part where we are nourished, began to weep, and, weeping, said these words: *Heu miser! quia frequenter impeditus deinceps.* Since then, I say that love was always master of my soul." (1)

Without any hope of ever possessing this woman, he loved her with the deepest, purest, and most ideal love of which Plato had ever dreamed. "She died young and in all the splendour of her beauty. The lover wept, and shut up his love in his heart as the miser shuts his gold up in his chest, ever cherishing this divine fire which one day would illuminate him and cause the divine flames of poetry to burst forth from his heart. Just as the astronomer, immersed in the vast field of the heavens, lives only for the star which he has seen shining one evening at the end of his telescope, a spangle of gold scattered by the hand of the Great Lapidary, and which he follows in the immense vault of the firmament, in the same way he lived only for this love which enabled him "to rise in his contemplations to the marvellous summit where dwells the Sovereign Beauty, which has neither beginning nor end, which knows neither increase nor decay, which has neither shape nor countenance." The name of the woman was Beatrice Portinari and that of the man was Dante Alighieri.

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(1) Dante, *La Vita Nuova.*

The First Love of Adam and Eve. The poet Milton unconsciously felt the influence of religion when in his splendid poem of *Paradise Lost* he describes in majestic harmony the first love of Adam and Eve.

> "Thus talking, hand in hand, alone they pass'd
> On to their blissful bower; it was a place
> Chos'n by the sov'reign Planter, when he framed
> All things to Man's delightful use; the roof
> Of thickest covert was inwoven shade
> Laurel and myrtle, and what higher grew
> Of firm and fragrant leaf; on either side
> Acanthus, and each odorous bushy shrub,
> Fenc'd up the verdant wall, each beauteous flower,
> Iris all hues, roses, and jessamine,
> Rear'd high their flourish'd heads between, and wrought
> Mosaic, under foot the violet,
> Crocus and hyacinth, with rich inlay
> Broider'd the ground, more coloured than the stone
> Of costliest emblem: other creature here,
> Beast, bird, insect, or worm, durst enter none;
> Such was their awe of Man. In shadier bower,
> More sacred and sequester'd, though but feign'd
> Pan or Sylvanus never slept, nor nymph,
> Nor Faunus haunted. Here in close recess,
> With flowers, garlands, and sweet-smelling herbs,
> Espoused Eve deck'd first her nuptial bed
> And heavenly quires the hymenean sung,
> What day the genial Angel to our sire
> Brought her, in naked beauty more adorn'd,
> More lovely than Pandora, whom the Gods
> Endow'd with all their gifts, and O too like
> In sad event, when to th' unwiser son
> Of Japhet brought by Hermes, she ensnar'd

Mankind with her fair looks, to be aveng'd
On him who had stole Jove's authentic fire.
Thus at their shady lodge arriv'd both stood,
Both turn'd, and under open sky ador'd
The God that made both sky, air, earth and heaven
Which they beheld, the moon's resplendent globe,
And starry pole: "Thou also mad'st the night,
Maker Omnipotent and thou the day,
Which we in our appointed work employ'd
Have finish'd, happy in our mutual help
And mutual love, the crown of all our bliss
Ordain'd by thee, and this delicious place
For us too large, where thy abundance wants
Partakers, and uncropt falls to the ground.
But thou hast promis'd from us two a race
To fill the earth, who shall with us extol
Thy goodness infinite, both when we wake
And when we seek, as now, the gift of sleep."
  This said unanimous, and other rites
Observing none, but adoration pure
Which God likes best, into their inmost bower
Handed they went; and eas'd the putting off
Those troublesome disguises which we wear,
Straight side by side were laid; nor turn'd I ween
Adam from his fair spouse, nor Eve the rites
Mysterious of connubial love refused:
Whatever hypocrites austerely talk
Of purity, and place, and innocence,
Defaming as impure what God declares
Pure, and commands to some, leaves free to all.
Our Maker bids increase; who bids abstain
But our destroyer, foe to God and Man?
Hail, wedded Love, mysterious law, true source
Of human offspring, sole propriety
In Paradise, of all things common else!
By thee adult'rous love was driven from men
Among the bestial herds to range; by thee,
Founded in reason, loyal, just and pure,
Relations dear, and all the charities
Of father, son, and brother, first were known.
Far be'it that I should write thee sin or blame,
Or think the unbefitting holiest place
Perpetual fountain of domestic sweets,
Whose bed is undefil'd and chaste pronounc'd,
Present or past, as saints and patriarchs us'd!
Here love his golden shafts employs, here lights
His constant lamp, and waves his purple wings,
Reigns here and revels; not in the bought smile
Of harlots, loveless, joyless, unendear'd,
Casual fruition: nor in court amours

> Mix'd dance, or wanton mask, or midnight ball,
> Or serenade, which the starv'd lover sings
> To his proud fair, best quitted with disdain.
> These lull'd by nightingales embracing slept,
> And on their naked limbs the flow'ry roof
> Show'r'd roses, which the morn repair'd."
>
> Milton, *Paradise Lost*, Book IV.

Was the love of the first human pair so pure and so idyllic? Alas! we may be allowed to doubt it. We must oppose logic to the dreams of the poets and descend from their chimerical heights to the regions of reality, for platonic and ideal love is, as Krafft-Ebing has remarked, "an absurdity, a chimera, a false rendering of a true sentiment." Let us therefore, before proceeding further, make a study of physical love and its physiology. Let us first take love in its widest acceptation from the philosophical point of view and ascertain its universality in Nature.

CHAPTER II.

Life and Love on the Earth.

Power of Love.—Life and Love on the Earth.—Universal Generation is a Law of the Universe.—Creative Force of Nature.—Love is the Chief Function of Man.—Mysteries of Love in Nature.—What is the Origin of Man and in what way must we study it?

Power of Love. We borrow the following passage from an author of an original and versatile turn of mind who has studied the subject of matter as a Philosopher as well as a Physiologist, in his work, *La Venus Génetrix.* (1)

"Life and fecundity, universal laws of Generation, harmony of the sexes, direct conjunction of the beings which people the universe; plaintive sighs and songs of joy and triumph; madness and despair; sublime aspirations and heroic devotion; universal attraction; perpetuity of species and enduring creations; shock of the elements and perpetual motion; animate pictures of living nature; all these things belong to Love which Modern Science cannot investigate too deeply, not for the agreeable excitement of the senses, but in order to gain a deeper insight into the laws of Universal Economy."

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(1) Paris, Gaston Samson, éditeur.

Life and Love on the Earth. "All animate movements are derived from a single motive power, physical or moral pleasure. Pain is but the absence of pleasure, as darkness is the absence of light, and cold the absence of heat. Pain therefore can never become the determinating cause of animal movements, any more than hatred, which is the opposite of love. But pleasure has three principal sources; the need of self-preservation, that of food, and that of reproduction. The habits, the wiles, the ingenuity, the contests, loves and talents of animals are derived entirely from these, because they acknowledge no other primary cause than pleasure on the avoidance of pain. The avoidance of pain is the seeking for pleasure, which is confined to the physical sphere in the animal, but extends to the moral sphere in man. In order that the species may be preserved, stings, armour, and all the defensive weapons belonging to animals have been fabricated; for self-defence they associate together, they prepare shelters, they avoid one another, hide themselves, become torpid and undergo metamorphoses. The need of food gives rise to enmities and antipathies; it renders some ferocious, bold and bloodthirsty; it makes others eager to hunt and endows them with cruel instincts; it causes certain species to become parasites, it teaches others fertility of resource, the bringing into play of all the refinements of instinct and all the power of their strongest affections. The attraction of reproduction depicts to us the love of animals, the mutual fondness of the sexes, their pleasures, their embraces, conjugal jealousies, combats and unions, either transitory or permanent, and admirable scenes of maternal affection.

"If we view the life of animals, it will be curious to observe their gambols, their skill, their disorderly assemblies, their concerted depredations and above all their amours. Observe the dragon-flies when coupled together: the male seizes hold of the female by the neck with his tail like a pair of pincers, until she brings her female organs close to the sexual parts situated close to the male's chest. Spiders, fierce even in the midst of the sweetest affections of nature, approach one another with caution for the purpose of coupling, and frequently meet with death instead of the pleasure which they seek. Crickets have a secret for enticing the females to love-meetings, and grasshoppers sing their love in joyous serenades. The female hemerobid stamps upon the wood to inform the male that the time for pleasure has come, while the glow-worm lights his nightly marriage torch amid the thickets. If it is a question of preserving the fruits of their loves, the dragon-fly lays her eggs in the water by sinking her belly into it; the saw-fly makes a groove in the bark of the young trees; the ichneumon buries its eggs and its sting in a quiet caterpillar, which unwittingly nurtures in its breast a mortal enemy; bees give the larvæ intended to produce males or females a particular kind of food, which develops their sexual organs, while the others remain neuter or eunuchs. Termites, or white ants, in their perfect state, are born from a single pair which the Republic shuts up in a nuptial bed with abundance of food. The female soon becomes pregnant; her belly swells enormously and she lays thousands of eggs at a time, which are borne away into different rooms of the immense city. Phriganes form under the water small cases made of bits of wood and the ephemera appears to the day only to accouple, to lay eggs and to die.

"Nevertheless, we are only acquainted with the product of the vital functions, without being able to penetrate the essence of the power which brings them into action. The life of organized beings may be divided according to the generality of the functions which it performs. And so the more a vital function is diffused in the system of animate bodies, the more fundamental and essential it is for their existence. Intellectual life is not indispensable to organized beings since the majority of them do not possess it and yet enjoy a no less perfect existence; idiots have a vital power no less energetic than that of men of genius.

In the same way, sensitive or animal life is not essentially necessary to beings, since plants live without it and animals are deprived of it during sleep. Sensation therefore is not the essence of fundamental and universal life. What then is this primitive life? It is the life of vegetation, which alone directs the organization, assimilation and production. Every organized being enjoys this vegetative life, and it is through it that even man takes his beginning in his mother's womb. Everything which suffices to engender, organize, increase, and renovate beings is furnished with this life.

"Every organized body takes its origin from beings absolutely similar to itself and is produced from them by the act of generation. From it emanate the organization and the life of every individual, whether it comes from seed, semen, egg, germ or cutting; whether it is born in a perfect state or subject to subsequent transformations. Generation is thus the torch of life of all living bodies, since without it no organization exists. The mineral, on the other hand, engenders nothing; it has neither family, nor species, nor relations, and always remains of the same nature. But the tendency of the living body is unceasingly towards its own destruction; its parts act unceasingly one against the other, and this violent and precarious condition has its fixed periods of duration; at first, its feeble dawn; then, its vigorous meridian, and lastly, its weakly and expiring decline. As a stone cast into the air soon falls back again to the ground, so the living being rises from the bosom of the earth to return there again. The organized body therefore is possessed of an interior impulsion or elementary vital force, which is communicated to it by generation. Life therefore is nothing else but the cause itself of reproduction; that is to say: universal love, that hunger for life which animates all organized matter. This is not shared in by individual existences, but is a general principle which pervades all organized beings, conferring upon them the light of life and the inner germ of their fecundity, because mere life is not sufficient for living creatures; they are under obligation to transmit this property as an eternal legacy of which they are but the depositaries. But as we each one of us have but a given quantity of this vital force, we must not waste it; for the germ of life contains within itself the cause of death. Excesses, especially those of love, shorten life, because they waste it away from the root by communicating it to others or by losing it. No longer to love is no longer to live; and by plucking the flower, you destroy the fruit. Nature is cruel, but she is just; she accords you all that is requisite for pleasure if you follow her laws, and she condemns you to death if you presume to infringe them. From this point of view the flower and the majority of animals command our admiration.

"The flower forms the nuptial couch of plants and its history is that of the bud which contains it before it expands to the light. Then it decks itself with its fairest ornaments, with rich and varied colours, with the sweetest perfume and the most elegant forms. This is the cradle of the seed which remains in a state of sterility in the ovary, (where it is to be found already in existence), if the stamens and pistils are removed. It would be the same if the stamens only were cut off; the seeds which would come after the flower when it is thus mutilated, would not be susceptible of germination. When the stigma of the pistils is higher than the stamens, it folds itself so as to reach the pollen and opens at the moment of fecundation; but, generally, flowers are fecundated by the dissemination of pollen in the air, and it is noteworthy that female flowers are always placed, under these circumstances, beneath the male flowers, so that they may more surely receive the influence of the fecundating dust. Artificial fecundation may take place at long distances. A flower of the black poppy when well shaken over a flower of the white poppy gives place to this; and in the following year the seeds of the white poppy produce all the intermediate shades between white and black. If these fecundations, instead of being made upon varieties of the same plant, are made upon two species of the same genus, hybrid plants will be formed, just as mules are among animals; but in the latter case successive generation rarely takes place, while in plants hybrids mutiply; but in order to ensure the permanency of the primordial colours and shapes of flowers, nature has been unwilling to extend variety and hybrids over species of two different genera. The pollen is capable of being preserved for a long time without losing its power of fecundation; it may be removed from the male organs and carried to the female organs; it is sufficient to scatter it over the female flowers. Nature is as lavish in the means as in the results of reproduction, and we can only conceive this natural fecundation of plants at long distances, by supposing that the pollen of these vegetables is dissolved, and suspended in the air, fecundating the pistils wherever it meets with them. Microscopical research has taught us nothing with regard to the vital composition of the pollen, and our knowledge on this subject is as obscure as that of naturalists on the nature of the genital liquid of animals: it is always the spark of life, the effects of which we observe and the original cause of which always escapes our closest researches. Human science bows before the incomprehensible majesty of creation.

"But what Science has ascertained is that organized bodies possess attributes which distinguish them from gross mineral masses. How could iron become capable of feeling and a rock feel the passions of love? What contractile fibres will ever be formed in a flint-stone? Even death does not blend together organized bodies with inanimate matter. Mineral salts and all inorganic substances, not being able to nourish living bodies, are incapable of receiving life from them; while nutritive matter, the remains of bodies which have been alive assume again the organization of life, are incorporated in animals and plants and repair their organs which have a tendency to decay. Living bodies therefore only find their nourishment in bodies which have already lived. Matter must be composed of alimentary molecules in order to afford nutriment, and must have been already organized in order to supply organization anew. A plant itself cannot flower away from all emanation of organized bodies; the earth-worm does not find its nutriment in sand or clay, but in the animal or vegetables molecules which are mixed with them. Not only does life emanate from generation but it is preserved and strengthened by preserving in all organic matter the scattered remnants of life which are still to be met with there. Life is assisted by death; and as it is necessary to destroy in order to live, the greater the destruction the greater also the generation ensuing therefrom: it is death which supplies the nutriment for existence and materials for the reconstruction of new beings. Everything circulates and changes, and nothing is lost for ever in the wonderful series of life. A wonderful harmony binds the molecule to the man and the imperceptible moss to the mighty cedar. Nature, taking for her groundwork the simplest living substance, enriches it with more elevated qualities, invests it with new organs, makes it perfect and finally forms from it the most noble species. Nevertheless, the flesh-worm and the moss are provided with all the small parts necessary to their existence; there is nothing wanting to them, and they are no more deformed in their species than ourselves. In Nature's sight there are neither first nor last, and each more or less organized being enjoys all the fulness of its life. Doubtless Nature has not always been what she is now and she hides in vain beneath the flowers the disorders and ruins of past life. A time perhaps will come when man will see her tired of the production of generations, and only proceeding with difficulty. The forests stripped of their garb of green will bend beneath the weight of years and the frost of winters, the seasons will become out of order; the sowing-time will be without shade and the summers void of harvest; the young child, scarce at the dawn of life, will fade away in its cradle like a rose-bud in its case. All that the earth produces will languish from its very birth and crawl along to death. The sun, wandering in the night of heaven, will cast but pallid rays; the stars dying like lamps without oil, will gradually become extinguished, and the universe, like some mighty corpse, will dissolve into fragments."

Amédée Cabral, *Venus Génetrix*, Gaston Samson. Paris.

Universal Generation. "Nature, Love and Life form an indivisible trinity, the outcome of which is universal generation. This is one of the primordial laws of the Divine Architect whom tradition gives us as the Creator of the world. Love, to love, to animate, to give a soul, to vivify, to produce an animation, is the work of generation. To live is to love something else than ourselves and to engender other beings. Love is therefore but the outward manifestation of life, it is in man the portion of our soul which is superabundant to our existence; it is the life of the species which perpetuates itself; it is the principle of life of all organized beings; it is the vivifying spirit of matter, or the soul of the world which sages hid from the eyes of the vulgar under the charming emblems of Venus Génetrix. It is love which disentangles the chaos of matter and impregnates it with life. It opens and closes the portals of existence to all the beings whom its voice summons out of nothing and sends thither again. The generative faculty is a general law in the universe: attraction in senseless substances: love or life in organized bodies. Love is anterior to organized bodies, it is the species which creates individuals in its image and in a fundamental mould which always recalls deformed races to the primitive type. Every alteration is only transient and Nature is able gradually to reassert its unacknowledged rights.

"As the majority of generations are effected in shadow and mystery, the ancient naturalists were not always able to see as much as they would have wished. and for want of perfect instruments and sufficient scientific knowledge various errors like that of spontaneous generation have been perpetrated in past ages: in present times, modern science has done justice to this error as well as to many others.

"Nature gives the flower, its beauty; the bird, its song; the quadruped, its strength; the butterfly, its lightness; and pleasure to all for the purpose of propagation. The individual is considered in so far as he is necessary for this end; he is then broken like a useless instrument. Apart from generation or love there is no existence in organized Nature. Engender or die! This is the universal law which may even be extended to the moral point of view: produce something, be useful to thy fellows, or disappear, for thou art but a parasite. See what splendour, what joy, what glory and magnificence are prepared by Nature's hands for the bridals of plants and animals. All is radiant with beauty in Nature; the earth, covered with verdure, resounds with accents of joy and sighs of pleasure; everything breathes forth love, like seeks for like and the attraction is mutual: it is the universal feast-day of creation. But when the generative function has once been accomplished, the flower fades; the butterfly falls down and dies; the lion and the bull seek peace and retirement, and man himself overcome with languor departs in silence.

"Only the cock crows. *Omne animal tristis post coitum, nisi gallus qui cantat!* an aphorism which we repeat.

"In truth, there is no full and intense life except in the time of love and generation: this is the only epoch at which men, plants and animals enjoy the plenitude of their being. In the time of youth, men and animals do not as yet exist entirely, they have but a portion of life; in the time of age, they lose it from day to day; they only live completely at the epoch of reproduction: Nature has despoiled the two extremes of life in order to enrich its middle portion.

"True life therefore is love and the power of propagation: without it men, animals and plants only vegetate on the earth.

"Life is not separated, as has hitherto been asserted, into individual existences: it is a general principle which enters into all organizable substances and which confers upon them the vital focus and the interior germ of their rich fecundity, for it is not enough for organized beings merely to exist; they must be able to transmit this property to other beings, as an eternal heritage of which they are but the depositaries.

"In fact, life does not properly belong to the individual. It is like a cordial which we eject after drinking it in the inexhaustible cup of time. Let us therefore refrain from seeking to fathom it. Let us admit the fact of life, but as one of the great mysteries of Nature. Let us first make ourselves high priests of Isis, but without wishing to discover the secret. That secret, when we have found it out, may perhaps be the end of all."

P. Dartigues, *De la Procréation Volontaire des Sexes*, Paris, Octave Doin, 1882.

Creative Power of Nature. In a little old work—*Mystères de l'Amour*— written by a Jewish Rabbi, the German Doctor, Goldschmid, published by his disciple Alexandre Weill, (¹) we find some very curious and philosophical ideas upon the universal law of Love on the earth. The doctor, who wrote his work when he was 84 years old, lays down the principle of the creative power of Nature.

"Every intelligent man who is an honest observer and whose judgment is clear and unwarped, will recognize the existence of a creative power of Nature. It is of no consequence that some persons identify this power with Nature herself and that others declare it to be self-creative, at the same time cause and effect, and superior to Nature and all that it contains. Whether matter thinks or not, thinking beings exist. He who created them, whatever be his name (I call him Jehovah)

(¹) *Mystères de l'Amour*, Alex. Weill. Paris, Amyot, 1868.

is a Supreme Being who was, and is and always will be, and who never changes."

Having laid this down, the good old man asks, what would have happened if God had created man perfectly virtuous? And he replies: "But I doubt if men would have been happy at having been created virtuous and without passion.

"What should we be without the passion of love? Nothing! Everything on earth loves, even the mineral, even the grain of sand.

"The law of attraction dominates all Nature. The plants love. Fools themselves love, and in my opinion, there is no brute (Behemoth) more brutal than a fool (Evil).

"However this may be, one law only dominates Nature, Isaiah has said that that one power alone winds across the worlds and animates all. Sooner or later, as Isaiah has declared, this law will be the sole belief of the universe."

Love is the Chief Function of Man. Let us continue our quotations from the Rabbi, Dr. Goldschmid.

"In ancient times, certain nations who were ignorant of the laws of God but felt the intimate connection which exists between Love and Reason, instituted a kind of worship of the genital organs. This is taking the effect for the cause. Man shares in the pleasures of love with all animals. He is only superior to them through *Reason.* It is true that through the same superiority of reason, human love far surpasses bestial love. Besides the fact that no human bring can love without sentiment, his love is not limited by the seasons and by physical incompatibilities. But love is not the cause, it is only the effect. It is not the object of life, it is but the means. Reason makes him equal with God his Creator. Through love this reason is perpetuated, not of itself, but by virtue of the law of its Creator. Love is the way, reason is the light. It is no less true that all reason is love and that all the functions of man turn upon love, which is the first emanation of reason. All the mysteries of the Greeks are founded on this intimate connection of love. *Hakadosch*, a Kabbalist, has proved this in his chapter on love, a copy of which has been given me in manuscript. Only, idolaters and atheists have always taken and still take the effects for the cause. Man does not think and reason in order to love; he loves in order to think and reason, and does all this so that he may glorify his Creator, of whom he is an essential part.

'Yes; Love is the chief function and consequently the greatest happiness of man. As the sentiment of love passes through the whole body from one extremity to the other, it brings all the muscles and fibres into movement. We can eat and drink without causing one fibre of the brain to vibrate, but no one will love for a minute without disturbing the cerebral cellules, from which will proceed a commotion, a cry, a word, a re-echoing in the heart, the beats of which make themselves felt in the extremity of the foot. From this it happens that all conversations, even of the most abstract nature, always fall back upon love. From this arises also the mysticism which the Illuminati have introduced in the communion of the flesh. And, lastly, from this also arises the chimera of depriving man of carnal love in order to devote his entire reason to divine love, under the pretext that love, by weakening the reason, wastes the powers of a man and diverts them from the love of God. If this were so, if the Creator had ever required this exclusive cerebral love, he would not have created man with organs of generation. It is true that, in his law, that is impossible to him. It is not probable that there is another law by virtue of which man could perpetuate himself as a race. The laws of Nature alone are divine. Everything beside them is folly and great blasphemy. The creators of the celibate, it is true, were afraid of the excesses of sexual love. In that they were right. But as they cannot prevent Nature from carrying out her functions, and as it is necessary even without a woman that the organs of love should perform their functions in order to be healthy, the celibate violates the law of Nature. Nature is unwilling that any man, who is the most perfect being and the most like to God, should love without glorifying Him, who in His supreme bounty, has given him this divine power."

The Mysteries of Love in Nature. "Who will unveil to us the mysteries of fecundation! Plants as well as animals seem to have pleasure in their generation: their organs become animated, the stamens are able to move, the petals unfold, the flowers display a kind of pleasure, and the laws of modesty appear to extend even to them. The stamens and their pollen may go to seek the pistil, but the latter retains chastely as far as the very bosom of pleasure: it awaits in silence the fecundating spirit which brings the zephyrs and remains calm.

"But when the animal enters into the season of love, it is stirred with a kind of fury. It no longer has any repose, but is tormented with a restless ardour and devoured by a secret fire; it vents its sighs and sorrows in cries; the bird in the thicket sings of its pleasures and its love, calls its mate, builds its nest and defies its rivals to combat. Time of love, period of war and combat. In this way Nature wishes to ennoble each different race, to set aside the weak and sickly and to give the advantage to the young and vigorous in order to maintain the species in all its force. Love is the brother of combat and Mars is always beloved by Venus. The females of all animals prefer the most courageous males, and through a very remarkable instinct of love the weakness of the one aspires after the strength of the other. Courage is the first title of love; the fervour of youth, the vigour of the limbs, the activity of the instinct, the impetuosity of the passions and the vehemence of the appetites announce that the individual is not incapable of giving life.

"It is a wrong estimate of love to consider it as a wholly brutal and carnal action; man wishes to give a relish to it by modesty, affection and actual tenderness; love exacts entire abandonment of self, it inspires reciprocal and total abnegation, it desires the whole soul and requires the gift of life itself. Whosoever knows not how to die is incapable of real love. Regard for the world, the laws of society and human conventions, all must give way when it speaks. Such is Love, as Nature makes it; it is everywhere master or it is nothing at all. There is no love without illusions. We believe that we love a woman for herself, it is however true that it is not she that we love; it is her generative faculty, it is that which must emanate from her, it is the posterity of which she is the stem, it is the mystery, the unknown, in a word the creation which we love in her and in ourselves. A pregnant woman inspires respect, tenderness and veneration, but never love. Nothing is blinder and yet more clear-sighted than love; it seems to exhale emanations of sympathy between the sexes. There is such an agreement between certain characters, such a harmony between certain temperaments, that we love or hate without knowing why. What is this sympathy of hearts, what are these secret ties which bind the sexes together through a mutual love? Whence comes this concordance stronger than our life and through which we become capable of a thousand deaths for the sake of the beloved object? Why does violent love become changed into furious hate? There is no mediocrity in ardent souls. The dimensions of a man's soul may be measured by the greatness of his moral love. What we call lukewarmness in love is rather littleness and nullity of soul. When the whole soul is not absorbed by the act of the sexual union, its products are weak and delicate. True love is dumb and it develops its power in solemn silence and in a kind of self-annihilation.

"The majority of men become illustrious through greatness of character, genius or valour; they have been the fruit of an ardent love and have had for fathers ordinary men, whose merit was wholly physical. Entirely material men produce the handsomest and most robust children in the world, because they follow more truly the simplicity of Nature, than we, the refined product of our time, whose distractions are sometimes of a too scandalous kind." Cabral, *loc. cit.*

What is Man's Origin and how must he be Studied? Ought man to be considered as a being apart from Nature, and does his title of King of Creation give us the right to study him abstractedly from Nature which surrounds him, and from the organized beings whom he has made subject to his laws?

This is not our opinion, and, as this work has a philosophical as well as a medical bearing, if it be necessary to have a knowledge of man in order to study the love of man, we consider it is requisite to have a knowledge of the animal world in order to have a thorough insight into man. And as the universal chain of beings which people the earth, the air and the water is unfolded uninterruptedly, let us begin our study not with the most lowly animal, not even with the humble blade of grass, but let us descend yet lower and begin with the creation of organized matter which will lead us to the search of the origin and of the secret of life!

CHAPTER III.

MINERAL MATTER AND VEGETABLE LIFE. THEIR INTIMATE DEPENDENCE.

Immense Progress of Natural Science since the middle of the Century.—The Creation of Organized Matter.—Mineral Matter is the Basis of the Creation of Organized Beings.—Appearance of Organized Life on the Earth.—What is a Plant?—The Progressive Evolution of Creatures is the Fundamental Law of Nature.—Circulus of the Metamorphoses of Matter.—Memento homo quia pulvis es et in pulverem reverteris.

Immense Progress of Natural Science since the middle of the Century. In my early youth, at the time when the Second Empire was established, that is to say just about the middle of this century, I took a prize in my class for the study of Natural History and Chemistry. At college in the first place, and then in the *Facultés des Sciences et de Médecine* at M....., in the South of France, we were solemnly taught the division of Nature into three kingdoms, the Mineral Kingdom, the Vegetable Kingdom and the Animal Kingdom. Geology, Botany and Zoology constituted separate sciences, as well as Chemistry. Moreover, the latter was divided into two and we were gravely taught that an impassable wall separated Inorganic Chemistry from Organic Chemistry.

How times are changed!

The lowest step in the scale of being in this world is occupied by the Mineral and thence it gradually rises and finishes in Man in a *constant and uninterrupted manner*. Some of the steps have been broken and have disappeared in geological revolutions and cataclysms, still they have existed and their places can easily be rediscovered at the present day. The modern Science of Cosmology will prove the unity of Creation, just as Chemistry which has broken down the wall of the two Divisions (Mineral Chemistry and Organic Chemistry), will demonstrate the unity of Matter, and Physical Science will shew us that Light, Heat and Electricity are but different manifestations of the one Power which causes our globe to move in Space and which preserves the Universal Life.

The Creation of Organized Matter. From where does organized matter come? from the earth or from the air? Until the unity of Matter was incontestably proved, the old Chemistry, rejecting the lessons of its mother Alchemy, named every body which was not ultimately decomposed, a *simple body*. These simple bodies were classified as Metaloids and Metals. The fact was soon recognized, and that without difficulty, that four simple bodies, Oxygen and Hydrogen, which by their reunion form water, with the addition of the Azote and Carbon in the air, with certain mineral matter found in the exterior stratum of the earth, formed the tissues of which Vegetables and Animals are composed.

But what was the initial starting point of the creation of organized matter, gifted with life? How could the atom of ancient Science, not gifted with life, be transformed into organized matter, gifted in the first place with life and then with movement, provided with organs of generation, and finally ending in Man, the masterpiece of Creation, with his power of language and reason, able to understand and celebrate the wonders of Nature and the Universe? This is a question to which we shall presently reply.

Mineral Matter is the Basis of the Creation of Organized Beings. It is in the external strata of the globe that plants find their nourishment (at the same time as in the air and the water) and assimilate the mineral matter which forms the osseous portion of their structure. Plants are synthetical apparatus whose office it is to organize mineral matter for the wants of animals. The latter, for the most part, browse on the grass of the field or feed on the fruits of vegetables. A large number, however, the carnivora, feed on the flesh of animals weaker than themselves. And man, predominant over all creatures, is *onmivorous*, feeding sometimes on vegetables and sometimes on animals.

Man who has brought the three Kingdoms of Nature under his yoke, makes use of minerals in the most different ways. He employs them for the needs of all his industries. The architect, the painter, the sculptor, the potter, and the agriculturist have need of mineral matter. By means of it man finds warmth and light, and produces steam which sets in motion the myriad wheels of industry; finally, by combinations of it, he evolves electricity, bearing human thought to the four corners of the globe with inconceivable rapidity. Were we to do away with all the riches supplied us by the different mineral strata of our globe, industry would be stopped; civilization would perish.... Much more, deprived of the phosphates and limestone necessary for their existence, vegetables and animals would become extinct, and nothing would remain of our globe but an immenense ball which, dumb and desolate, would continue its fatal course in the heavens.

THE MINERAL THEREFORE IS THE DIRECT ANCESTOR OF THE VEGETABLE AND THE ANIMAL.

Appearance of Organic Life. Organic life made its appearance on the earth from the earliest times of the palæozoic period: the older the land, the more inferior are the animal and vegetable types in their different branches. One fact, which stands out prominently in modern Geology, is that the nature of organized beings depends essentially on the composition of the terrestrial surface and on the condition of the atmosphere. Fundamental differences in the shape and organization of the plants which are produced correspond to each geological period. And, with regard to this, we ought to mention that the three kingdoms are in such a state ot mutual inter-dependence that we cannot comprehend how it would be possible to write the natural history of plants and animals without a previous study of geology.

What is a plant? Organic life begins with the plant. The vegetable, however, is very simple in its composition. Through its roots it drinks in from the soil and water, and through its leaves from the air, the materials necessary to its existence. The cellular tissue of which it is almost entirely constituted is essentially composed of *cellulose* and chemical salts derived from the soil. Cellulose is a material composed of Carbon, Hydrogen and Water (C^{12} H^{10} O^{10}). The old official Science asserted that "vegetables are organized beings, provided with the function of nutrition but unprovided with the functions of relation, that is to say of feeling and voluntary movement."

Here we must recall the opinion of Claude Bernard, who considered that before studying the physiology of man it was necessary to study that of plants. Official Science has committed an error. What, in fact, constitutes motion does not consist in the rapidity, the frequency, the continuity and the extent of the act, but in the motion itself, provided that the external circumstances demonstrate that the motion is conscious and reasoned on the part of the being who performs it.

A vegetable, unquestionably, does not change its position, nor does it move save on its stem; but motion is not a change of place, otherwise the only motion of the oyster would be through the motion of the waves, and yet the oyster opens and closes its shell at will. There are animals of a still more imperfect type, in which the vegetable and the animal kingdom seem to blend together; in these beings of the animal kingdom motion is still more imperfect, and yet no one dreams of denying that they have feeling and motion. We are therefore in a position to maintain that a vegetable moves, although it does not change its position. What is the nature of this motion? It is easy to appreciate it. If a plant which has been grown in a hot-bed, in a dark corner where it has only received light through a narrow aperture, be transplanted, it will immediately, with greater or less rapidity according to the texture of its stem, bend towards the side from which the light comes to it. The experiment may be repeated in the open ground; it will be sufficient to cover up the plants with a bell of opaque glass furnished with an opening a few centimètres in diameter on one of the sides. In this case, a number of plants, bending to a level with this opening, will in the end, owing to their growths, pass through it and recover fresh air and light.

We cannot say that this is a purely mechanical movement of which the plant has no perception, for there are no mechanical movements in organized bodies and this is precisely one of the qualities which distinguishes them from the beings which are not organized.

Shall we treat as mechanical the movement of certain flowers which open or shut, or of certain leaves which rise or fall at the approach of night? This would be absurd; the plants act in this way with the evident object of protecting themselves against moisture, against a fall of temperature or some other atmospheric cause, but these movements are voluntary on the part of the plant, as it is impossible to explain them by any external cause.

And the movements of the Sensitive Plant (*Mimosa pudica*) which folds up its leaves at the slightest shock, are these purely mechanical? But the property of an external impulsion is always to produce the same result; now, why should not the same shock and the same impulsion produce the same effect on all plants?

At the period of fecundation, the stamens of a number of plants bend over the pistil; are the movement and the object purely physiological and peculiar to the plant which performs this action? Again, can it be said that the plant has no consciousness of it? This would be to refuse to yield to the evidence of facts, if we were to see automatism even in these delicate functions.

We lay it down as an absolute principle that these functions of relation begin with the organic kingdom and that feeling and motion, however feeble and rudimentary they may be, are precisely the characteristic which differentiates this kingdom from the inorganic kingdom.

Plants therefore are organized beings, provided with the functions of nutrition and reproduction, together with the function of relation in harmony with their condition of organic inferiority. The *organs of nutrition* are represented by the stalk, the root, the leaf and the bud, and the organs of reproduction by the flower, the fruit, and the seed.

It is impossible not to remark the immense step taken by Nature from the mineral kingdom to the vegetable kingdom. In the mineral kingdom, bodies are changed by the, so to say, mechanical action of natural forces, by the shock resulting from their antagonism or from their affinity. The air, the gases of the atmosphere, water and fire transform matter and give birth to special bodies. All these movemeuts of inorganic life are but a series of chemical phenomena which the hand of man, (and this is a special characteristic of these phenomena), is able to reproduce at his will. On the other hand, even the most rudimentary beings of the organic kingdom derive their nutriment from the ground, the air and the water, and in these beings there *resides a germ* which will give birth to beings organized like themselves. The new body has not yet abandoned the soil where the substances of the mineral kingdom vegetate, but it holds to it only by slender ties, by the roots which select the substances which plants require, while their stem, rising into the air, imbibes through its leaves the gases, the heat and the light which contribute to the same object.

Moreover—and this is striking evidence of its origin—its seed must be deposited in the midst of these minerals brought together by physical influences, in order to accomplish the series of transformations which will give birth to a creature similar to that which has produced it. And a new and still more decisive step is requisite: we must go to the animal kingdom in order to come across the organized being which, definitely abandoning the ground, will make choice at its will in the air, in minerals, in vegetables, and in the animal kingdom itself, of those essential matters which, in its successive transformations are necessary to its individual existence.

At length the new creature will reproduce itself with assistance from the earth, for, if some of the most imperfect species still entrust to it their germs or ovules, this is only done in order to find in it a temporary shelter intended to protect the budding of the germs.

These facts tend to prove that everything has its origin in the mineral kingdom, and that the history of one of the kingdoms cannot be written independently of the others. The three kingdoms are joined together like the fingers of a hand. It is unnecessary to insist on the ascensional progress of these phenomena in order to demonstrate successfully that the constantly progressive evolution of creatures is the fundamental law of Nature.

Circulus of the Metamorphoses of Matter. Whatever may be the differences which separate the members of the three kingdoms, mineral, vegetable and animal, it cannot be denied that they are united together by such affinities and by so constant a harmony that they may be regarded as the result of a series of phenomena all proceeding from one another. This is shown moreover by the irresistible logic of facts. Plants live and are developed by means of inorganic substances; water, hydrogen, carbon, oxygen, azote, and a certain member of salts which they borrow through their leaves and roots. All the matters which enter into the composition of the plant belong exclusively to the mineral kingdom. It may therefore be said that the mineral kingdom gives birth to the vegetable kingdom and continues to provide for its nutrition and its preservation. Without minerals it is impossible for there to be any vegetation.

Plants, in their turn, prepare the assimilable substance necessary for the life and development of superior organized beings, so that it may be said that they make ready the tables at which animals eat. The latter utilize these substances, transforming them into water, carbonic acid and ammonia, cast them out, and thus effect the restitution to the mineral kingdom of the materials which have been received from it by plants.

The beings, therefore, of the three kingdoms form one vast *circulus* in which matter is metamorphosed, circulates, and returns to the place from which it started:—from the mineral to the plant, from the plant to the animal, from the animal to the mineral.

The Catholic Church expresses this truth in the priest's words in the service for Ash Wednesday: "*Memento, homo quia pulvis es, et in pulverem reverteris.*"

CHAPTER IV.

THE ORIGIN AND THE SECRET OF LIFE.

Where does Life begin and where does it end? Where does Death begin and where does it end?—The Secret of Life.—The Microzyma is the Vital Unity.—Unity of the Principle of Life in all Organized Beings.—The Microzyma is the Beginning and the End of every Organism.—Folly of Criticisms directed against the Microzyma considered as the Vital Unity.—The Microzyma exists everywhere in Nature.—Life and Death are only Modes of Transformation.—Universal Biology.—Evolutions of Microzymas in Cellules or in Bacteria.—The Great Law of the Natural Evolution of Organized Beings.—Experiments shew the action of the Microzyma upon pure Mineral Matter and upon Organized Matter.—The Microzyma explains the Great Laws of Evolution, Heredity and Natural Selection.—Reproduction of Béchamp's experiments by Foreign Scientists.—The Microzyma is the Key of Modern Science with regard to the Origin of Organic Life.

Where does Life begin and where does it end? Where does Death begin and where does it end? Science has revealed to us that every body, from the plant to the animal and from the animal to the man, is nothing but an *organized* mineral compound which returns to the *inorganized* mineral, at the time of final decomposition. The secret of the organization and the decomposition of the mineral, as well as the secret of life and death for a long period escaped all the researches of Science. And during all that time the reply of the Spiritualists to the Naturalists who were seeking in vain for the secret of life, was: "Search, you will but waste your days and break your crucibles in pieces; the secret of the organization of the mineral, the secret of life, is the Soul, the immortal breath which came down from Heaven to animate the creature; the mineral with which this is enveloped is only a visible form, the animated being, the *ego*; the organization of matter escapes the researches of your scalpels and microscopes. If everything is nothing but matter, shew us the mysterious Worker who organizes it and who, superior to his work, endures after disorganization, after death!"

And Science was dumb!

Those who wished to continue the contest invoked the *cellule*, that first element of the organization of all the tissues of the organic kingdom both in plants and in animals.

"The *animal cellule*," said the German, Virchow, "corresponds to the primordial utricule of the *vegetable cellule*.

"The cellule represents an elementary form which serves as the base for all vital phenomena: it is the only elementary form which pervades all the organic kingdom and which always remains the same.

"This constancy of the cellule enables us to affirm in the most positive manner that it is the element which characterizes everything which has life; without its preexistence no living form could exist, and to it are attached the progress and the conservation of life."

And so, in the opinion of Virchow and of the majority of scientists, matter lives and organizes itself in plants and animals under the *cellular* form. The *cellule* lives, is nourished, developes and communicates the life which is in it to matter, which it assimilates under the form of new *cellules* which take away with them the shape, the life and all the properties with which the *mother-cellule* is endowed.

This was the final position taken up by Science.

Be it so, was the reply of the Spiritualists, you have found perhaps the unity of organization in the organized body, *omnis cellula e cellulâ*, every cellule comes from a cellule; but the cellule is not independent of the whole organization of the body of which it forms a part, it is born with it and dies with it. It is an *element of organization*, it is not the organizing agent itself, and besides, the cellule is not even the initial form of all organized matter; for it consists of tissues in which it has never been met with. After death, the cellule undergoes a rapid and complete destruction. Now, that which is transitory cannot be the *vital unity*.

To this there was no reply; and as Science found it impossible to discover this mysterious Worker existing by and through himself, *per se*, surviving the destruction of his work and making use of the mineral elements as his primal material out of which he formed plants, animals, men, in a word, all organized beings, —the *vital unity* continued to be to the Spiritualists something immaterial and superior, a direct emanation of the Divinity, who, after animating the creature, left it at the moment of death to fly away to other destinies. And, to be consistent with their belief, these philosophers conceded a soul even to animals, though but an imperfect one, to which, though immaterial, they did not attribute immortality.

And meanwhile the Pleiad composed of Claude Bernard, Pasteur, Virchow, Dumas, Pouchet, Joly, Robin, Béchamp, Berthelot, Schroeder, Chevreul, Davaine, Estor, Neucki, Giacosa, Toste, Milne Edwards, Meunier, Ousch, Gerhardt, Liègeois, Eugène Godard, Baratansky, Grasset, Van Tieghem, Huxley and a crowd of other Scientists, Physiologists, Chemists and Naturalists, bending over crucibles and microscopes, or with scalpel in hand, were seeking to discover the secret of Life.

Science has not deceived their expectations. It was reserved for a modest Professor of the Faculté de Médecine at Montpellier, A. Béchamp, to discover this Worker who was called miraculous, if the term was scientific.

The Secret of Life. This discovery is the most admirable and important which Humanity has registered. A. Béchamp has discovered the infinitely small, organized, structured, existing of itself, proceeding only from itself,—the immortal agent of all organic transformations: *it is not engendered by anything and engenders everything:* it is not the result of any alliance nor the product of any organic or inorganic combination; and everything which is organized, plants, animals, men, proceeds from it, is created and fashioned by it, and it survives its work and the decomposition and disorganization of all the beings which it has formed and of all the bodies which it has organized. And it forms, and moulds, and weaves these bodies and living beings, plants, animals and men, with the solid, liquid and gaseous, which are like the clay, the *primal matter*, of this invisible sculptor; only more fortunate than Prometheus, he is able to animate the statue.

The Microzyma is the Vital Unity. This infinitely little, this vital unity discovered by A. Béchamp is the Microzyma.

"*The tissues of all living beings*, says the learned Professor, *from the tallest tree to the lowliest moss, from man to the humblest animal, contains microzymas. Now these microzymas are, in plants and animals* a semine et ab ovo, *the workers who, the given conditions being favourable, are charged with the weaving of the cellules.... They unite and mass together in the shape of a sphere, and thus united they secrete a covering, and the cellule is formed.*

"*And in this state they perform their highest function, which is to form the tissues of plants, of animals and of man.*"

And so the cell of Virchow and of the scientists of his school which according to them was the vital unity, is found to be merely the chrysalis in which the microzyma is enveloped for its evolution for the performance of its creative work.

We have already stated that all organized beings of the vegetable and animal kingdoms are entirely constituted of the cellular tissue which is modified and gives birth to various fibres, muscular, nervous, osseous and cartilaginous, which compose the organized being of the two kingdoms.

We shall continue our quotations. The passages between inverted commas, where we do not give the name of the author, are taken from M. Béchamp; and while we reserve to ourselves the right of emphasizing the great biological, physiological and philosophical importance of this admirable discovery, we shall never allow ourselves to paraphrase the master's thought.

"In reality, it is not the cellule which is the support of the vital activity, nor does this activity reside primarily in it, but in the microzyma; the microzyma forms the organism, because it is organized and the organism is endowed with chemical activity because the microzyma is already endowed with it.... The cellule is not the permanent histogenical element; its existence being transitory, it cannot be accounted the vital unity. Beyond the cellule there is the microzyma; *the latter forms the cellule and remains when it is destroyed.* The microzyma is immanent, when it is compared to the cellule; it is the support of the vital action, of the life, and it is the primordial organized element."

Thus the cellule is decomposed and the tissues are disintegrated; the organized, animated being is disorganized and dies. The microzyma survives and proceeds to the creation of other beings.

J. Grasset, the colleague of Béchamp at the Montpellier Faculté de Médicine, also remarks with regard to this:

"The microzyma is truly the vital unity, since it is at the same time the last anatomical element of our tissues, *the first term of animal life*, and the embryonic principle of every organism. Most properly then ought the microzyma to become the basis of a new and complete theory for normal histology, and, consequently, for pathological histology."

We will add again with Béchamp who foresaw all the extent of his discovery from another point of view: "The microzyma is the organized essential, autonomous element, *having life in itself through primitive destination, for which philosophy is searching.*"

In fact, positive and natural philosophy has found its basis and its essential principle: the first organized being, living by and through itself, immortal, surviving all the beings which is creates, contained in germ in the *primordial atom*, the organic principle at the same time as the inorganic principle. The microzyma is the Worker, and minerals are the matter which it makes use of to mould the vegetable and animal bodies to which it gives life.

Unity of the Principle of Life in all organized Bodies. The discovery of the *vital unity* is a fact of such importance from every point of view that we cannot insist too strongly on the nature of the microzyma and on the part which it plays in the organic world,—an infinite part, since it is the first organized principle accessible to our senses, the producer of life. A. Béchamp frequently returns to this: we shall continue to quote from him.

"Microzymas are structured and living; they are able to multiply and to communicate to the matter which serves for their multiplication the property which is in them, the chemical and physiological activity which is in them and characterizes them, because they transform this matter into their own substance and it becomes what they are. In the organism all the cellules are in the first place the fruit of their activity, and these cellules in their turn, being constituted are, I repeat, apparatus in which these microzymas acquire new aptitudes, by undergoing a kind of incubation while they multiply there; it is thus that the vitelline microzymas become microzymas of the liver, microzymas of the pancreas, microzymas of the pepsic cellules, nervous microzymas, and microzymas which, at a given moment, acquire the fecundant property in the spermatozoid. These are not gratuitous assertions *but ascertained facts*. If there is something marvellous in all this, the marvel is not of a different order to that manifested by all organized beings."

And so, in this admirable work of the organization of a living being, animal or man, the microzymas divide the labour! some produce the egg, others the semen which is fecundated by the former; and, the work of fecundation accomplished, each proceeds to mould a portion of the living being, some the liver and the pancreas, others the pepsic cellules, the nervous tissue, etc.

Yes, we may utter the word "marvellous," but it is a marvel consecrated by 30 years of observation, experiments, analyses and incontestable facts, admitted to-day to the glory of the great physiologist by the scientists of the whole world. Nearly all of them, in fact, have taken up one by one these experiments and observations, and have arrived at the same conclusions; the microzyma is certainly the primordial living being, the first manifestation of the double principle, material and dynamic, contained in the atom.

And it is an extraordinary thing, the immense import of which will be seen immediately, that it is impossible to distinguish morphologically between the microzymas of plants, the microzymas of animals *and the microzymas of man*; they are absolutely identical in structure and differ only in the nature of their functions.

We may therefore with all confidence lay down the great law which governs the organic world. *There is a unity of the principle of life in all organized beings.*

The Microzyma is the Beginning and the End of every Organism. But one of the most striking points and that which surprises us most in this admirable discovery, lies in the fact of the persistence of the microzyma after the death of the being which owes to it its structure, its organization and its life.

"There is, in all organized beings, something more than matter, something deeper even than the form and the structure, that is to say the physiological and chemical function which has been laid upon it. And that is not derived from the cellule, which is transitory, but originally from the properties which have devolved to the mycrozymas, which, as we have thoroughly established, are not only endowed with chemical and physiological activity, but are also the makers of the cellules and the tissues. Now one microzyma is derived from another microzyma. The microzymas are therefore the beginning of every organism, and they are also its end. When, after death, the whole of an organism has disappeared, form as well as life, the microzymas still remain; they do not perish but continue to be endowed with chemical and even with physiological activity; they serve, in the final analysis, under fresh conditions, to bring all organic matter back again to the mineral state."

The microzymas go through their evolutions, are transformed, give birth to animate beings, plants, animals or men, and they survive the destruction of their work. And so, just as mineral matter is transformed, but can never be annihilated, the microzyma, the primordial principle of organized life, is transformed but can never disappear; it is as immortal as matter of which it is but an emanation; thanks to it, life cannot become extinct in the universe, and it is for this reason that A. Béchamp has given as an epigraph to his fine work on *Microzymas* these words which completely sum it up:

NOTHING IS THE PREY OF DEATH; EVERYTHING IS THE PREY OF LIFE.

Folly of Criticism directed against the Microzyma considered as the Vital Unity. Some envious individuals pretend that there is nothing to prove that below the microzyma there are not still smaller animals which the microscope has not seen, and that, to say the least, it is a rash thing to consider the microzyma as the definitive vital unity.

This objection will not stand the test of examination.

The mere fact that the microzyma survives the animated being which it has created, is sufficient to prove that it is really the sole and only Creator. In the second place, it is an unanswerable argument that our present microscopes can reach far beyond the form of the microzyma, and thirty years of research and innumerable experiments have done nothing for the discovery of anything beyond the microzyma, and, if nothing has been discovered, when attention has been turned to these researches, it is because there is nothing to discover.

It is useless to declare that for a long while scientists believed the cellule to be be the vital unity, and that this has not prevented the discovery of the microzyma! This objection is of no more value than the preceding, for all the scientists who have studied the cellule perceived the microzymas, but took no account of them; and, looking upon them as infinitesimal granulations of no importance, they made no study of them.

The merit of A. Béchamp, we may add, upon which his fame will rest, consists in his saying to himself when he observed them: "there must be something there." He entered on the search, and the result of it was his immortal discovery.

In the same way, Newton, when he saw an apple fall from a tree in his garden, a thing which thousands of others had seen before him, said to himself: "there must be something there." And he discovered the law of gravity.

M. Emile Burnouf refutes in the following manner the objection drawn from the possibility of meeting with the *Vital Unity* below the microzyma.

"In my opinion, this objection is more specious than solid, and if it is evident that reduced to a geometrical abstraction, matter like space cannot be infinitely divided, there is ground for believing that there are no *living forms* which are *atoms*.

"Moreover, I am much inclined to admit that man is not in a vague medium between two infinites, but that the living forms are, in reference to him, in determined and measurable proportions; so that there are some of them which are smaller than all the others, and others which are the greatest of all, but not infinite. Are you not struck with this truth, that everything which may be said of the infinitely little, may also be said of the infinitely great? Why therefore do we not think of arguing seriously regarding living beings of which man would be but a small element, while we make no scruple in supposing the existence of infinitely small beings. The latter supposition does not appear to me to be capable of being sustained any more than the former, and in that there is an illusion.

"I am therefore inclined to believe that our perfected instruments reach to the lowest forms of life here below, and that beyond these very small and very simple animals, whose origin you are investigating, there are no others smaller still. Among other reasons which lead me to this opinion, is that the microscope can reach far beyond these forms which are still tolerably great, and that nevertheless it does not observe that they are lost in the infinitely little, like the stars in the depths of the Heavens. I see therefore no solid metaphysical reason which ought to arrest you in your progress."

The Microzyma exists everywhere in Nature. And so the Microzyma is met with everywhere, in the air, in the water, in the ground, in all gases, in all liquids, in all mould, in all fermentations, and in all animate beings of the vegetable and the animal kingdoms. According to Béchamp's expression: "matter is alive only through its microzymas," and everywhere where they are found they assimilate the mineral matter which surrounds them, they organize them by transforming themselves and giving them life.

"Yes, this marvellous virtue of adaptation to their media of the microzymas, their vital resistance, their perpetuity explain how and why they are imputrescible, how they are met with in limestone and other rocks, in mineral waters, in the ground and even, as M. Le Ricque de Mouchy has shown, in the bicarbonate of soda of commerce.

"These are facts, demonstrated and verified. Yes, there are atmospheric microzymas and geological microzymas, in the chalk and other limestones, in the rocks and in the ground which we cultivate, and all living beings contain them, not accidentally but necessarily, since they are the agents of the chemical actions which are effected there, the makers of the cellules and the constructors of their anatomical elements and of all the tissues. And these microzymas which were confounded together under the appellation of *molecular granulations*, amorphous matter supposed to be without structure and without life, of which chemistry, physiology, histology and pathology took no account, with which scientists only concerned themselves in order to declare their insignificance, which held no place in their doctrinal preoccupations; yes, these microzymas have their place to-day in the sun of science, and intrude themselves even upon those to whose preconceived systems they are an embarrassment.

Life and Death are but Modes of Transformation. "And all these microzymas, of such diverse origin, endowed with variable chemical activity, have a common aptitude; that of devoluting and appearing under the form of bacteria and of all the morphological conditions, vibrions, ancylobactes, which precede the bacterial form. I have been struck for a long time with this strange fact that a little air, or chalk, or dust from the street, or arable land, or water, or a little animal or vegetable tissue, in suitable media, produces bacteria. What is there then in common between the chalk, the dust from the street, a little water, and an animal and a vegetable, that they should produce bacteria? You know what it is—the microzyma."

When A. Béchamp declared that he had found microzymas even as far as the chalk of the old geological strata, there was a general chorus of incredulity.

"A little astonishment," as M. Estor, Professor in the Montpellier Faculté de Médicine, remarked, "was permissible at the first mention of such an unexpected discovery. Limestone, extracted often from considerable depths, contains living beings which perhaps have slumbered for ages and which only waited for a little heat and moisture, that is to say for a favourable medium, in order to revive. This was not the only feeling which was expressed: the appearance of the microzymas has had the honours of a great discovery; laughter was raised at the resurrection of these little beings, just as laughter was raised forty years ago at Dujardin's sarcode."

As a matter of fact, great discoveries have always excited the laughter of jealousy and ignorance: steam and electricity have already had this honour, which has been shared at a later date by the microzyma. Steam and electricity have made their way and the microzyma is following in the same course, *id est:* reconquering the world to which it has given birth.

Thus the microzyma, an organized atom, is evoluted to perpetuate the work of Nature and to ensure its operation. Nothing begins and nothing comes to an end; life and death are only modes of transformation.

Universal Biology. Béchamp's discovery illuminates at one stroke all the horizons of natural science and biology, by giving them a fundamental basis which is the very principle of the universal life.

As we see from the quotation from Letourneau, the cellule even yesterday was looked upon as the primordial form of every organized being, plant or animal, but the cellule does not exist *independently* of the organized being: at the death of the plant or animal or man it *does not survive* the general disorganization, it has not life in itself and through itself, it does not exist *per se*, and it disappears entirely together with the special organized form which the cellular evolution had created. This therefore was not the principle of life itself, it was only the first manifestation of that still unknown principle. The cellule was the first link of the chain, it was not the creator of it.

To-day the veil is lifted and the mystery exists no longer. The vegetable and animal cellule is moulded by the microzyma, by aid of the materials which it draws directly from the mineral kingdom; and its work is not limited to that, for it is again the artisan of all the later evolutions which the cellule undergoes in order to finally constitute a determinate type; and when this special type, this being organized by it, dies, the microzyma survives it, and is employed in restoring to the current of the mineral circulation the different materials which it has made use of to organize the plant or animal which is undergoing decomposition. "The microzymas," says Béchamp, "are at the very root of organization; without them there is no organization, no living matter."

The cellule proceeds from the microzyma, but the microzyma proceeds only from itself.

And so the universe is like some mighty workshop in which mineral or unorganized matter is incessantly being transformed into organized matter by the primordial principle of all organization and of all life: the microzyma.

Evolution of Microzymas into Cellules or into Bacteria. "In order to procreate, the microzymas evolute according to circumstances and the conditions in which they find themselves, *either into cellules or* *into bacteria, one of these two forms of organization always excluding the presence of the other.*

"In the circumstances in which we observe the presence of bacteria, we remark as follows: this small organism does not appear all at once like the *Deus ex machinâ*, but the microzymas which were isolated become really prolific; it is then seen that they are as it were agglutinated by twos into figures of eight, then into heaps of three, four or more grains, owing no doubt to a shooting forth like that which directs the multiplication of yeast; then the grains of the heaps of microzymas appear to lengthen, the bacterion itself appears as the fusion in some way of all these grains into one continuous and linear whole. At the same time as these transformations are being effected, the membrane goes to pieces and its tissue does not appear to be formed much sooner than the bacteria."

Let us now see how the microzymas evolute into cellules in any matter. Take, for instance, the mother vinegar which is membranous and in which the microzymas are very abundant and are united together by a substance called hyaline.

"In proportion as the cellules appear, it is as though the microzymas were consuming at the same time the aliment supplied by the sweetened bouillon and the hyaline matter which unites them, and, becoming agglomerated, were secreting the matter which forms the covering of the walls of the cellule. In fact, while the cells are being formed, the movement of fermentation which produces the alcohol, makes its first appearance. The fact is that the cellules do not begin throughout the whole mass of the mother vinegar at the same time, but at the surface first, and little by little to the bottom, so that in the end there is a membrane formed of an agglomeration of cellules loosely joined together, and which are easily detached by the slightest rubbing. And if we observe attentively, we see on the edges of the fragments isolated microzymas, disengaged from the membrane, which join together again, and cellules originating in the surrounding liquid by the same means. We then observe some of the cells thus formed the granulous contents of which resembles a simple kernel, and in this finely granulous mass some microzymas which are agglomerated after having become free, while other cellules are observed in process of formation; they are still indeterminate, although they have the same shape as the others, as if the enveloping membrane was not yet completely finished.... The cellules of animal tissues originate from microzymas by a process similar to that which engenders the mother of vinegar." Béchamp, *loc. cit.*

Admirable discovery, to which no other can be compared for the greatness and importance of its results, even if we go back to the earliest ages in the history of mankind.

It does not merely make a hole in such and such a system; it upsets them all. All the theories and systems which preceded it fall alike into a heap of ruins; Pouchet's theory of *Spontaneous Generation*, the *Theory of the Protoplasm*, Pasteur's *System of Microbes*, the *Monese* of Haeckel and the *Blastême* of Ch. Robin.

It would undoubtedly be very interesting to compare together all these different systems with the theories of Béchamp, but we should be going outside the already too extended limits of our subject.

Suffice it to say that it is impossible to dispute Béchamp's assertions, for they rest upon the continuous experiments of thirty years, experiments which all scientists have been able to repeat, and which are absolutely convincing and conclusive.

The Great Law of the Natural Evolution of Organized Beings. It can now be understood what is the importance of Béchamp's discovery, from the point of view of general biology and philosophy. In the universe there is a dualism which cannot be denied; the mineral kingdom and the organized kingdom.

Well! thanks to the microzyma which is found at the beginning as well as at the end of every organized type, *which is met with everywhere in this terrestrial world*, atomistic philosophy has found its definitive base; in face of the atom of mineral matter, it can place the atom of organized matter, the microzyma.

Virchow said more than half a century ago: "the organized world is only a republic of cellules."

There is only one word to be altered in this declaration, for it to be a scientific truth: the organized world is only a republic of microzymas. The object of everything in the universe is *Life*. Now, what would be the use of mineral matter, if it had not by its side and as eternal as itself its agent of organization? The discovery of the microzyma is the definitive triumph of materialist doctrines in science: the microzyma, in fact is a material being, organized, structured, living, imputrescible and physiologically indestructible, which is unable to multiply without general matter, but which has life in itself and communicates it to the matter which it organizes.

All the scientists of the school of Lamarck, Darwin, Huxley, Broca, and Haeckel, that is to say the most imposing scientific phalanx which has as yet appeared in the world, being obliged to give some foundation for their naturalism, have admitted that matter summed up in itself all the properties and all the forces of transformation so as to pass successively from mineral matter to organic matter, and from the latter to the organized, structured, and living being, from which have issued all the vegetable and animal types. This hypothesis once admitted (and it is only an hypothesis), none of them having as yet been able to detect matter in the different stages of its transformation from the mineral to the organized being, this hypothesis, we repeat, being once admitted, the *great law of natural evolution*, with all its consequences, is triumphantly affirmed. Thanks to their admirable labours and from that day only, it may be said that the science of sciences, the science of matter in all its manifestations, was founded. But the results attained did not prevent the partisans of the old metaphysics from bringing the objection against the new science that it was based on a hypothesis. The microzyma, by changing the hypothesis into a reality, has driven spiritualism to bay within its last entrenchments. With the microzyma, mineral matter may be seen evoluting into organic matter, and organic matter into organized, structured and living matter.

Matter continues to evolute and to evolute eternally under the direct action of the microzyma.

"Microzymas are the beginning of every organism; they are also the end. When, after death, the whole of an organism has disappeared, form as well as life, the microzymas remain; they do not perish, but continue to be endowed with physical and physiological activity, since they produce vibrionians, each according to its kind, and these vibrions, bacteria and bacteridia are living agents which, together with the microzymas, serve, in the final analysis, under new conditions, to reduce all organic matter to the mineral state.

"A microzyma, could it but speak, might parody the poet and say: I am organized and I am alive; nothing belonging to organization and life is alien to me! In fact, the microzyma is truly organized, and it is alive from the triple point of view, chemical, physiological and histogenical; in it are summed up all the ideas that we possess regarding the phenomena which are ascribed to the vital properties of matter. The protoplasm and the blasteme, considered as essential living matter, are only alive through the microzymas which they contain; the cellule itself, constituted in the state of an independent organ or organism, is the fruit of the life and energies of the microzymas which have formed it, but it is transitory; and, when it is destroyed or destroys itself, its microzymas reappear with aptitude to reproduce it or to evolute into bacteria, according to the circumstances in which they are placed." (Béchamp.)

"The appearance of this new element, the microzyma," says Professor Baltus, "does more than withdraw from heterogeny or spontaneous generation the sum of facts hitherto placed to its credit, and connect them with the common law of biogenesis; it re-establishes, besides, this truth so long considered as absolutely known, and which has not ceased to be so; that the static and fundamental characteristic of what is called living matter does not lie in chemical composition, but in the heterogeneous arrangement of the materials, in a word, in the building of the structure. There is not therefore any living matter, there are only living organisms, and it is in the apparatus and not in the organic vehicle, a complex medium of alible and dissimilate materials that it is proper to see the characteristic element essentially active and living of the protoplasm; there, and nowhere else, is the real seat of its evolutive properties."

Nothing can be more conclusive. In other terms, all the facts attributed to spontaneous generation must be attributed to the microzymas, which remained alive in spite of ebullition in the matter experimented upon, and evolute, according to their nature, into vegetable or into animalculæ, communicating to their organic vehicle in the material form in which they are enveloped, their evolutive properties.

"At the origin of every being and every cellule, before any development of a living organism, there is the microzyma; all life, every plant, every animal, and even man himself is reducible to the microzyma." (Béchamp.)

What a marvellous thing! and what endless meditations press upon the mind when we consider that this being whose office it is to organize life in the universe does not generally exceed in diameter one five hundredth part of a millimetre, and that there are smaller ones still which the best object-glasses can scarcely perceive! And it is this vital unity, this organized, irreducible, imputrescible, *physiologically eternal* atom which the atomistic philosopher has been seeking for for ages! Henceforth everything in the world, as Lamarck, Darwin and Haeckel predicted, is reduced to the mechanism of the microzyma, but this law which, in the last of these scientists rested merely on an hypothesis, is at the present day, thanks to the microzyma, a scientifically demonstrated truth. We shall proceed to prove it.

Experiments show the Action of the Microzyma upon Pure Mineral Matter and upon Organized Matter. It is to the laboratory that we shall refer in order to prove that the microzyma does not only evolute in already organized matter, but in matter where the life of the whole has disappeared—and still further, that when placed in contact with pure minerals, it takes possession of them, organizes them, and communicates to them the life which is in it.

We borrow the fact from the *Comptes rendus de l'Academie des Sciences*, t. LXXXI, p. 671, (1875).

"M. Méhay having made a mixture of 18 grammes of acetate of soda, nitrate and phosphate of the same basis, dissolved in a certain quantity of water, soon observed an interesting transformation; the acetate of soda was more or less oxydized and transformed into carbonate, while it freed itself from the azote; at the same time it formed a substance of a slimy appearance, "which by its physical constitution," the observer says, "showed some characteristics of resemblance to bodies which certain chemists consider as semi-organized."

It was not M. Méhay's object to study this substance, and so the observation was carried no further; but M. J. Béchamp, brother of the illustrious scientist who discovered the microzyma, repeated it under the same circumstances, and, directing his attention to the slimy substance, carefully noted all the circumstances of its formation.

At first it was nothing else but a granulous membrane formed of microzymas, free or joined together in twos, and in strings of grains of very small bacteria and at first of small vibrions, the whole being extremely mobile.... Eight days after a fresh examination showed that the vibrions had disappeared, and had been replaced by new bacteria. These were true fermentations, the real cause of the reactions observed by M. Méhay. Finally separated from the medium in which it originated, this mixture of microzymas evoluted into bacteria, and transferred, for instance, into starch, rendered it fluid, and then at a given moment, the medium no doubt no longer lending itself to new transformations, the microzymas abandoned the bacterial form, and evoluted afresh into pure microzymas.

Thus the atmospheric microzymas having fallen into M. Méhay's artificial mineral medium, adapted themselves to it, and, by means of the material at hand, effected the synthesis of the cellulose and the azote matter which they required in order to evolute into vibrions, then into bacteria and finally to become microzymas again, thus accomplishing in a single experiment the whole cycle of their evolution into organized vegetable and animal bodies; microzymas at the beginning, makers of cellules and of all the tissues during life, and at the time of death evoluting into vibrions and bacteria in order to effect the restitution of all the matter to the vegetable kingdom, and finally becoming again free microzymas—ready to begin again their perpetual evolution with new materials: and it is thus that death is only one of the phases of life. The microzyma is life. Every organized body, vegetable, animal and man, is but the shelter temporarily constructed by a band of microzymas, a shelter which it abandons when the materials have grown old and are no longer sufficient for its requirements, in order to build another with the materials which are regenerated by dissimilation and by their return to the simple mineral state.

It only remains for us to show, in an experimental manner again, that after the death of an organic form, it is the microzyma, which has organized this form and been its vital agent, which is charged with the office of distributing to the mineral kingdom all the materials which served to compose the individual.

During life, no one raises any doubt about this; but let us see if it must not be the same after death. We have said that the microzyma was the agent of this restitution; it remains for us to furnish a proof. We borrow the materials of it from Béchamp.

"In the year 1868, wishing to verify for the twentieth time this hypothesis and employing a sufficiently long time not to leave any doubt, he buried the body of a cat in pure carbonate of lime, prepared and creosoted so as to free it from all germs; the whole was placed in a large glass bottle, closed in such a way that dust and germs could not enter. Let us bear the fact in mind that the animal's body was completely enveloped in a thick layer of prepared carbonate of lime.

"The bottle was left on a shelf in the Professor's laboratory from 1868 to the end of 1874.

"When it was opened at the end of this period, the mineral restitution of the body, apart from a few insignificant fragments of bone, was entirely accomplished. Under the layer of carbonate of lime were found a few centimètres of artificial chalk, transformed by the organic dissolution; there was no trace of vibrions or bacteria; but, in the place previously occupied by the cat's body, was seen a veritable crawling mass of microzymas which having finished their work were moving about in millions.

"Numerous experiments before this had always shewn that the microzyma, in order to perform its work of destruction and restitution to the mineral kingdom, evolutes first into vibrious and bacteria, and returns to the microzyma state by regressive evolution, when its work is once effected; the fresh experiment was therefore formally conclusive in favour of the observations already made. What germs could have been introduced, what outside influences could have had effect through the creosoted carbonate of lime? None at all, for the creosote prevents any external germ from developing. The work of dissolution was entirely due to the microzyma.

"But, in order to check this most conclusive experiment, the Professor resolved to begin again, in order to detect the microzyma in the midst of the period of transformation.

"A second cat was buried under the same conditions at Montpellier in 1875, and the Professor's change of residence caused the operation to be completed at Lille, in a colder climate and consequently one less favourable to a rapid work of disorganization; the bottle was opened in 1882, and destruction, as was to be expected, was less advanced them in the preceding experiment.

"In the carbonate of lime adjoining the part where the animal's remains had been placed, as well as in what still remained of it, a mass of microzymas were found, gathered together in twos, in fours and in strings, and also some very fine bacteria among which the Professor was able to distinguish the *bacterium cupilatum* of meat in a state of putrefaction."

It is known that any organ, liver, brains, viscera etc., has its special microzymas: all those which had accomplished their special work of destruction under the form of bacteria, having nothing further to do, had evoluted afresh into microzymas; all those whose work was not yet completed continued their labour under the bacterial form.

The Microzyma explains the great Laws of Evolution, Heredity and Natural Selection. Can anything more conclusive or definitive be stated? Here are facts which speak for themselves and oblige us to formulate the law. It is complete.

At the beginning of organic life the microzyma alone exists; it takes possession, as in M. Méhay's experiments, of the mineral matters at its disposal, it adapts itself to them, organizes them, evolutes into a cellule and constructs each part of the animal or vegetable tissues; while the organization of life endures it is, in one word, preminently the *vital agent* and at the same time the mechanical force of the parts of the being which it has constructed, and, at the time of decomposition, it directs the restitution to the mineral kingdom of all the materials it has employed; then, when decomposition has been effected, it remains the sole survivor of its work and, as soon as it encounters a favourable medium, is ready to undertake fresh organic creations.

This explains how, in the depths of geological strata, especially in masses of limestone of organic origin, milliards of living microzymas are met with which have slept there for ages: these are the microzymas of extinct vegetable and animal species. There is the natural explanation for physiology and histology of the great analogies which are established between geological fauna and flora, and the fauna and flora of present times. And, in the same way, the great laws of evolution, heredity and natural selection obtain their definitive sanction. All the species have one common ancestor, the microzyma: all of them through an unquestionable heredity are, from the point of view of form, issues of one another: all new organs have for their origin a new function necessarily acquired and transmitted from ancestors in past ages, organs acquired through cellular extension and formed by the microzymas.

Verification and Reproduction of Béchamp's Experiments by Foreign Scientists. Béchamp's experiments upon microzymas have been reproduced by foreign scientists who have verified and checked them with the greatest scientific strictness. We will relate a couple made by two scientists, a Swiss and an Italian, MM. Neucki and Giacosa.

The demonstration, as we shall see, is so clear that it cannot leave the shadow of a doubt even in the most prejudiced mind.

"In the first experiment, a piece of the liver of a rabbit was taken from the body of the freshly killed animal, under a spray of phenicated water, so that no germs from the air could be introduced into it, and with all the care of Lister's process was plunged into a large mass of Wood's fusible alloy, brought up to three or four hundred degrees, then allowed to cool to one hundred degrees and covered with a layer of water phenicated in the proportion of 5%. Thus, the substance already impregnated with phenicated water, was plunged into the molten alloy under a layer of strongly phenicated water. The piece of liver was then kept in the centre until the alloy was completely solidified. It will be seen that it was impossible for the slightest atmospheric germ to traverse this metallic mass. The whole was then placed for four days in a stove at a heat of 40 degrees.

"When this period had elapsed, the piece of alloy was opened and the liver submitted to a microscopical examination; the two scientists found in one part, microzymas in the simple state, and in the other, microzymas which had already evoluted into bacteria.

"The demonstration was complete; it proved, as it had been proved a hundred times previously, that the microzymas survive the dissolution of the individual, and that they retain their power of creative evolution, even when they are deprived of atmospheric air; lastly their physiological indestructibility issued triumphantly from the experiment.

"In a second trial, MM. Neucki and Giacosa proceeded differently.

"A bell filled with mercury was turned upside down upon mercury contained in an enamelled pan. The whole apparatus was then heated to the boiling-point of mercury, and then brought to 120 degrees. A layer of water phenicated in the proportion of 5% was then poured on the mercury. The organ intended for the experiment was extracted with the same precautions as in the previous case, and directly it was cut out, was passed through phenicated water and mercury until it was introduced into the bell full of mercury, to the top of which it rose. After a few days, the organic matter entered into fermentation, an already evident proof of the presence of microzymas; it was then withdrawn from the mercury and submitted, as in the preceding experiment, to a microscopical examination: it shewed microzymas which had already evoluted into bacteria."

It is hard to imagine anything more conclusive than this. Such facts are overwhelming. They are no longer a more or less ingenious hypothesis which it is possible to discuss. Here all discussion is impossible in the face of such proofs as these.

The Microzyma is the Key of Modern Science on the Origin of Organic Life. Thus the element, the primordial principle of all life, of all organization, of all evolution, of all transformation, is the microzyma, the immortal and material atom of life, intimately connected with the mineral atom immortal like itself, it being impossible to conceive one without the other. In fact, the microzyma primordially organized and living, the germ of all organic transformations, is only a mineral compound and does not evolute except through mineral matter, which would itself have no reason for existence without it, and could not be separated from it.

And we cannot see in it the product of a specious theory. The microscope and the laboratory have allowed us to be present at all the evolutions of the microzyma whose existence and function are henceforth a fact of exact science, a fact as experimentally proved as the power of steam, the decomposition of water and the rapidity of light.

This great discovery has given life to all the natural sciences by giving them a *sure basis* which they lacked before. Its immediate result is to change into unquestionable laws the theories of evolution and descent; how can any objection henceforth be raised against the principles which flow from them, when the primordial form common to plants and animals has been found; how can any different origin be given to the various branches of the organic kingdom, when it has been definitely demonstrated that they are all derived from the same initial form, and, to make use of a geneological image, all attached to the same trunk?

And lastly, this discovery by replacing Haeckel's *hypothetical monese* by the microzyma, raises at one stroke to the height of scientific truths all the researches of the illustrious Professor of the University of Jena, and enables us to comprehend the part of the cellule in the general law of generation.

CHAPTER V.

Animal Life.

The Method to Follow.—Animal Life and its First Manifestations.—General Characteristics of the Animal Kingdom.—Natural Classification of Animals.—Absolute Concordance of the Three Kingdoms.

Method to Follow. Now that we know the origin of life and the secret of the formation of organized bodies, now that we know the close bond which unites the three kingdoms, let us pass on immediately to the animal kingdom at the head of which we have placed man. We have said that man was an animal and on that account we deem it necessary throughout to make a study of animals before we proceed to that of man: the study of animals commences at the ill-defined limit which separates the animal from the vegetable kingdom.

We shall therefore begin with a rapid but complete study of the animal kingdom.

Animal Life and its First Manifestations. We have now arrived at the highest phenomena of Nature. The manifestations of animal life are, in fact, nothing else but the culminating point of the transformations undergone by matter in the two preceding kingdoms.

The period when animals made their appearance upon the globe cannot be fixed in a precise manner. The most ancient fossil remains are met with in the argilaceous and slaty schists and their organization is appropriate to the state of the water and the atmosphere of those primitive times. It can therefore be established that the palmozoic period witnessed the birth of the first organized beings of the animal kingdom of which we can discover the traces, but this is no proof that the animals which we meet with in the geological strata of this period, were really the first which were developed upon the earth. As regards the first manifestations of organic life, positive science which cannot accomodate itself even to the most ingenious hypotheses, is obliged to declare that the most complete obscurity reigns upon this most mysterious problem.

General Characteristics of the Animal Kingdom. Animals are characterized by their organs and by the functions which these organs perform.

These functions are of all kinds. Some, which are called *Natural Functions*, have for their object the conservation and the reproduction of the individual. Others, which are named *Relative Functions*, serve to afford the animal communication with the outer world. The third class, distinguished as *Intellectual Functions*, has for its object the generalization of the ideas caused by the sensations and the manifestations of the intelligence which result from them.

The name of *tissue* has been given to the organized matter which composes the body of the animal; they are divided into *cellular*, *fibrous*, *muscular*, *nervous*, *osseous and cartilaginous tissues*. All animals do not possess these different tissues. The most common in the animal organization is the cellular tissue; it is formed of spongious masses of fibres and of their *lamellae* which intercross in such a way as to form cellules. The fibrous tissue is only a modification of the cellular tissue. The muscular tissue is also formed by the union of muscular fibres joined together under the double action of the cellular tissue and the fibrous tissue. The nervous tissue is composed of a soft granulated matter affecting a rosy, grey, and most frequently a white coloration, formed of *nervous* cellules and of tubular fibres called *sensitive nervous tubes* and *motor nervous tubes*. It is this matter which constitutes, not only the nervous mass, but also the brain, the cerebellum and the spinal marrow.

This tissue, it cannot be denied, is the most precious of all those which constitute the animal organism. It receives all the *sensations* and transforms them all into ideas; in it and through it are developed sensibility, memory, will, and all the wonderful faculties which animals possess in different degrees, and which have raised man so far above his other companions of the animal kingdom.

The osseous tissue is a compound of a gelatinous substance, of phosphate and carbonate of lime: it appears in a form which is well known. The whole of the osseous frame of vertebrates, that is to say the skeleton, is formed of it. These tissues are the principal element of the organization of animals, and from their multiple combinations originate the organs suitable for the different functions which animals perform. To these elements it is convenient to add the blood or nutritive fluid, the object of which is to maintain the vitality of the organs and to supply the elementary tissues with the materials necessary for their nutrition and reparation.

The functions resulting from the activity of the organs which constitute the body of the living being, are characterized by the part which each plays specially in the whole.

Thus we have the functions of *nutrition* and of *digestion*, the functions of *circulation*, of *respiration*, of *locomotion*, of the *nervous system*, and of *reproduction*.

By the word function, is meant the action itself performed by the organs or apparatus of circulation, the apparatus of locomotion, etc.

All animals do not possess the various organic tissues of which we have just spoken; the result of this is that they do not all perform the same functions, and moreover that a very great variety exists in the manner in which they perform either the functions which are common to them, or the functions which are peculiar to them. Another consequence to be pointed out is that some possess faculties with which others are not endowed.

If we take the animals of the lowest rank in the organic scale, those which represent, so to say, the first manifestations of life, we observe in them a great identity of organization, and, consequently, similar modes of action in each animal, and this is, so to speak, the characteristic of these primitive beings: all the parts composing them fulfil the same functions, so that they can be multiplied by the section of their parts, and life will continue its evolution in each fraction which will soon form a complete animal. It is also curious to observe that far from arresting the vital movement, the division into fractions only gives to each a greater activity in development. Tremblay, the naturalist of Geneva, who was the first to point out in a scientific manner this strange peculiarity, took one day one of those fresh-water polypi called *hydras*, and opened it, stretched it out and cut it up into as small pieces as he could, and each of these pieces quickly became an animal as complete as that which had served for the experiment.

The same thing takes place in certain plants, and it is impossible to help noticing, at the commencement of organic life, the resemblance which exists upon this point between individuals of the vegetable and animal kingdoms and bodies of the mineral kingdom which can also be divided up without altering their nature. With regard to this, it is not unimportant to recollect that vegetables and animals are only organized transformations of purely mineral products.

But in proportion as we ascend the scale of beings and come nearer to man, the organism becomes complicated; all the parts which compose an individual tend more and more to differentiate and to perform distinct and multiple functions; life does not show itself any more under the form of a single organ, a simple accumulation of animated cells, retaining the same vital energy after their separation; it results, on the contrary, from the co-operation of a number of different organs, each of them provided with special faculties.

One of the important differences which has to be pointed out between the organic and inorganic kingdoms is the *vital resistance*, so great in the case of minerals which endure until some external cause comes to destroy them, and so feeble in the case of organized beings. It is impossible for us not to remark that the nearer the organized being comes through its imperfection to that inorganic kingdom, to which all organized beings return, even man at the hour of decomposition, the greater is the vital resistance.

The instance which we have just quoted, finds its application here again: like the mineral when divided into fractions, all the parts of which retain their qualities, that is to say, continue to exist, the fresh-water polypus withstands the dividing up in its different parts, and, moreover, each part displays the primitive type.

But, when the animal progresses a stage further, it is seen to lose, in proportion as it advances, this vital resistance. Thus, the fresh-water polypus, which is only a gelatinous mass, containing extremely small globules, may be divided up in every direction, and each fraction, however minute it may be, will form a complete whole, while the earth-worm can only be multiplied if the cutting is performed lengthways.

In the case of this latter animal, the functions of nutrition and digestion begin to be localized in different organs: it is also provided with canals which serve for the circulation of nutritive matter in all parts of the body, and possesses a rudimentary apparatus of locomotion; but, on examining these organs, we remark that they are all distributed in a uniform manner, from one extremity of the animal's body to another, the result of which is that after the animal is divided into sections, each part forms a whole, entirely similar, possessing the same apparatus and, consequently, the same faculties; the sources of life are not affected, and each segment becomes a new earthworm.

Continuing this progressive ascent in the series of animate beings, we soon perceive that the physiological work, the object of which is to maintain life, tends to become more and more divided, and that each function becomes, so to say, the appanage of a special organ, which localizes itself in one part of the body, instead of extending indefinitely throughout its whole length. The fractions of the animal cannot then retain at each segment all the organs necessary for their existence, and life disappears from the divided parts which are no longer the exact representations of the entire animal.

We shall now bring to an end the general ideas of natural history which it seemed to us desirable to recall to the reader's mind, and in what follows we shall only study that which has to do with the function of reproduction. But, may we again be allowed to remark that the cellular tissue is the *parent* of all the other tissues, and it may be said that all the others are only modifications of it. This cellular tissue is the very foundation of the animal economy, for in proportion as the individual rises in the scale of beings, this tissue is transformed and gives birth to new organs. It alone forms the material of which is composed the body of animals of the most simple organization, as well as of animals of the highest order; and in man it is distributed among all the organs as a reserve material, intended to maintain and repair them, and to give consistency to the whole.

The cellular tissue is the mass of clay with which nature, that wondrous sculptor, has moulded all the bodies of the animal kingdom.

Natural Classification of Animals. We shall now see by what series of animated beings nature, in her admirable and progressive effort, has risen up to man. The connections which exist between the animal kingdom and the vegetable kingdom are so intimate that it is extremely difficult to determine the line of separation between them: thus fresh water *spongillae* are classed by some in the animal kingdom and by others in the vegetable kingdom. Nature thus passes, without apparent effort, from one kingdom to the other, maintaining, as it were, by an invisible cement, the connections between the two kingdoms. The same phenomenon is displayed between the different classes of animals, which are almost always only separated from one another by imperceptible organic shades.

All the various forms of the animal organic kingdom may be divided into four branches, according to the fundamental types of their organization. This idea, which Science owes to Georges Cuvier, is grounded upon the structure and upon the conformation of the nervous system, as well as upon the progressive development of the organs and faculties. These branches comprise, in the order of their development:

1. Zoophytes or Radiata.
2. Molluscs.
3. Articulata.
4. Vertebrates.

These branches are again subdivided into different classes, according to the degree of elevation in the organic scale attained by the animals composing them, and thus we gradually arrive from the most imperfect animal to man who occupies the highest place in the organic series.

Zoophytes or Radiata comprise five classes: 1st, Spongillæ; 2nd, Infusoria; 3rd, Polypi; 4th, Acalephæ; 5th, Echinodermata.

Molluscs comprise seven classes: 1st, Bryozoa; 2nd, Permiciaria; 3rd, Brachiopoda; 4th, Acephala; 5th, Gasteropoda; 6th, Steropoda; 7th, Cephalopoda.

Articulata also comprise seven classes: 1st, Radiata; 2nd, Helminta; 3rd, Annelida; 4th, Crustacea; 5th, Arachnides; 6th, Myriopoda; 7th, Insecta.

Vertebrates comprise five classes: 1st, Fishes; 2nd, Batracians; 3rd, Reptiles; 4th, Birds; and 5th, Mammifera; among which is man.

These Classes are next divided into Orders, Orders into Tribes, Tribes into Families, Families into Genera, and Genera into Species. Whatever may be the diversities of aspect, shape, manners and customs observed among the animals belonging to the different classes and sub-divisions, it may be said that all proceed from one another, and that, in the common plane of their origin and development, they are joined together like the links of an immense chain. It does not lie within our scope, as will readily be understood, to enter here into particular detail of their organism. The preceding part has been written in order to show that man, intelligent as he may be, ought not to regard with contempt and disclaim the other animals which are inferior to him. He forms a part of the class of mammifers which comprises the animals possessing the most complete organism and the most developed faculties. The class of mammifers, like the other classes of Vertebrates, is subdivided into a crowd of orders, families and species, which do not enter into the plan of our work. It is enough to say that all these subdivisions are intimately connected.

It will be observed in this rapid survey of the four great branches of the animal kingdom that Nature has followed undeviatingly the progressive advance which we have pointed out. She commences with plant-animals (zoophytes) which form the feature of union, the passage between the vegetable kingdom and the animal kingdom; several of them indeed are organized in such a manner that certain naturalists persist in ranking them under vegetables, while others consider them to be animals.

The line of demarcation separating the animal kingdom from the vegetable kingdom is so ill-defined that it cannot be scientifically established. Nevertheless from the most imperfect of the *spongillae* to man, the highest representative of the organic kingdom, there is not one series of the animal classes which could be suppressed without taking away an essential link of the chain and rendering the order of transformations impossible. What has just been said of the animal kingdom may be applied with the same logic to the vegetable kingdom: it is equally impossible to suppress a single class of plants.

Absolute Concordance of the Three Kingdoms. Vegetables do not only contribute to the nutrition of animals. They are their ancestors in the organic evolution; they have preceded them and prepared the organized materials from which must proceed the mass of cellular tissues which forms the foundation of the phenomena of animal transformation.

Nor is this all. Vegetables directly absorb the mineral products, transform them for the benefit of the animals which assimilate them, and restore them directly to the mineral kingdom.

Vegetables, properly speaking, are nothing but organized mineral matter: for the crucible of the chemist they are only composed of mineral salts, liquids and gases which have been organized under the influence of heat, electricity and light, by virtue of a creative power whose laws man will never succeed in grasping.

Every part therefore, on this earth, of the mineral which is the primary material, passes through the vegetable and the animal, to begin again perpetually the same series of transformations.

Thus are established the unity of composition between inorganic and organic matter, and the absolute concordance of the three kingdoms. Profound mystery of existence, wonderful circle in which inevitable forces and laws enclose matter, will you never allow Science to lift a corner of the veil which hides from us the secret of your operations?

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CHAPTER VI.

MAN'S PLACE IN THE ANIMAL KINGDOM.

How ought Man to be studied?—Man's Place in Nature.—Parallel between Men and Animals from the Anthropological Point of View.—Man is a Primate.—Classification of different Scientists.—Comparison of Primates with other Animals.—Man's Place in the Classification.—His Origin, is it Single or Multiple?—His Genealogy.—His Future.—Summing-up and Conclusion.

How ought Man to be studied? Natural Science has been studied far too long, as though Man were a being apart in the Universe. A deeper knowledge of biological science has at length cured us of this vanity, says Letourneau in his *Evolution du Mariage et de la Famille*, (Paris, Violet Frères, Editeurs, 1888.) That the human biped is the most intelligent of terrestrial animals is an incontestable fact; but, by his biological texture, by his organs and the functions of those organs, he is evidently nothing else but an animal which may easily be classified in the series as a two-handed vertebrate mammifer.

Letourneau then asserts that any study of human sociology must logically be preceded by a corresponding study of animal sociology. Moreover, as biology is definitely the support of sociology, it will be necessary to seek in the physiological conditions themselves for the origin of the great sociological manifestations.

"I am undertaking the task of writing a history of marriage and the family. Now the sole object of the institution of marriage was the regulation of sexual unions, while the object of the latter is to afford satisfaction to the amorous appetite, one of the most imperious biological wants, but love is only a conscient incitation, a trickery, as Montaigne calls it, which urges men and animals, in that which concerns them, to provide for the conservation of the species, to pay the ancestor's debt, according to the Brahminical formula. Before studying sexual relations and their more or less regulated form in human society, it will not be unsuitable to say a few words about generation in general, to give a short sketch of the fundamental parts of physiology, and to show how tyrannical are the instincts to the formation of which it has led and which tend to soften the most savage animals."

We see all the importance which Letourneau attaches to the study of the sexual function in animals before proceeding to the study of this function in man.

Parallel between Men and Animals from the Physiological Point of View. A learned anthropologist, Paul Topinard by name, has made a special study of "*L'Homme dans la Nature*," (1) from the point of view of Anthropology, that is to say the knowledge of man from the physical point of view. After a learned discussion on the position which should be assigned to Anthropology in the study of natural science, Topinard admits that: "To sum the matter up, Anthropology, 1st, in its wide, encyclopædic sense, is synonymous with the knowledge of man: the practical applications alone ought not to be separated: 2nd, in its restricted sense it is synonymous with the study of man as an animal."

Topinard, in his masterly work, after a profound study of the different races of mankind, according to their anatomical characteristics, compares men with animals and devotes to this study the whole of the second part of his work. We cannot dream of following him so far, and we shall be content with giving a summary of his conclusions.

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(1) Paris, Alcan, 1891.

Man is a Primate. Man is a vertebrate mammifer.

He is also a *Primate*, a name which comes from the celebrated Linnaeus.... The characteristics of Primates are summed up as follows:

A cerebral type absolutely different to that of other mammifers.

A cranial type distinguished among those of all other mammifers by the relative importance acquired by the cerebral part and by the special rounded shape of the posterior region, by the development of the middle cerebral depressions beyond the cerebellous depressions, and by their orbits brought near together, when looked at in front, closed behind and provided with an *os planum*.

A mandible having its two parts joined together at its point of origin, on a level with the symphysis.

An anterior member more or less adapted at most of its parts for prehension, with extended radiating movements in the cubitus and bearing at its extremity a hand, that is to say, long and flexible fingers and a short and slender thumb bending towards the palm.

Flat nails on the fingers and toes.

Teeth of three kinds, continuous, with omnivorous molars bearing four or five tubercles.

Two pectoral mammæ, a unilocular uterus, a discoïd placenta, an external testicle enclosed in a scrotum and a pendant penis.

Lastly, a short cœcum and a simple stomach with one exception.

Among these characteristics we observe the hand which, in a more or less perfected condition, is together with the brain, the fundamental characteristic of Primates.

Classifications of different Scientists. What divisions, finally, must be established in the order of Primates? What is the place of Anthropoids in relation to other apes, and that of man in relation to Anthropoids? Three systems are before us with regard to man.

1st. To separate him completely from the other Primates, as has been done by Blumenbach, Cuvier; the majority of classical writers who followed him, and, among foreign contemporaries, by Huxley since 1871.

2nd. To leave him among the Primates with the Anthropoids and constituting with them one and the same family with a value nearly equal to that of the families coming after, in accordance with Linnæus, Borg, Saint-Vincent, Lesson and Broca in 1878-80.

3nd. To still have Man among the Primates, but forming therein a special family more or less of the same value as these coming after as wished by Charles Bonaparte, Dugès, Godman, Isidore Geoffroy de Saint Hilaire, Huxley in 1868, and by Broca in 1870-6.

We adopt with Topinard the last classification of Broca in 1877. ‘At this time he was giving his course of lectures at the school of Anthropology on the parallel between man and the other Primates, and all the characteristics drawn from the brain and the skeleton led him to the conclusion that there was a less distance from Man to the Anthropoid than from the latter to the Pitheci, we therefore considered ourselves authorized in 1884, in our treatise on Linnæus' Anthropology, to present in the following form what seemed to us to be his latest thought.

Broca (1877—1880).

Primates	1st, Anthromorphes	A. Men B. Anthropoids
	2nd, Apes	C. Pitheci D. Cebi

The comparison, it must be remembered, is purely anatomical. It can, consequently, be regarded in a perfectly unprejudiced spirit and is quite compatible with the doctrine of a human Kingdom essentially characterized by morality and religion, doctrines which were professed by M. de Quatrefages." (Topinard. *Loc. cit.*)

Comparison between Primates and other Animals. Topinard then proceeds to study the brain in the whole of the animal series.

A. From the point of view of the circumvolutions of the brain, he concludes as follows:

"To sum up, the Primates are separated from other mammifers by the following characteristics:

"1. Relative atrophy of the anterior arc of the great lobe, and complete atrophy of its upper and lower arcs which are annexed to the mantle of the hemisphere.

"2. Considerable development of the frontal lobe.

"3. Division of the parietal lobe into three sub lobes.

"4. Occipital lobe characterized by the occipital horn of the ventricule, the Cornu Ammonis, the calcarene fissure and the two occipital fissures.

"5. Special type of the circumvolutions outlined in the lower degrees, attaining its full development in the Anthropoids and in Man.

"Among the Primates there is with regard to the latter an ascending progession, each group being the continuation of the preceding. The Anthropoids are the highest degree among Apes, Man occupying the degree immediately above them. The cerebral type of Anthropoids is that of a human being not comptetely developed, as the cerebral type of Man is that of a developed simian.

"Consequently, Man by his general cerebral type is certainly a Primate, and the opposition of this type with that of other Mammifers is so decisive that no argument can surpass it: *man must be resigned to remain in the order of Primates.*"

B. From the point of view of the shape and size of the brain, comparing Man with the other Primates, Topinard on the other hand admits a conclusion the reverse of the preceding. He finds that the weight of the brain and the cranial capacity, that is to say the cerebral volume is so far superior in Man that Man must be separated from the other Primates and formed into a special division corresponding to a sub-order in the order of Primates.

C. From the point of view of the shape of the animal's cranium and its transformation into the human cranium, Topinard concludes as follows: "Consequently, keeping to craniology, we ought to say that it is totally opposed to the union of Man and the Anthropoids in one group, and almost wholly favours the union of the Anthropoids with the Pitheci and Cebi."

"D. The study of the characteristics connected with the biped or quadruped attitude: Head, vertebral column, thorax, pelvis, permits us to say that the Authropoids are clearly separated from Man and ought to be placed in the same division as the Apes.

"E. In the study of the members it is recognized, in short, that the Anthropoids resemble Man in their upper limbs, but—all else being equal—differ from him in their lower limbs."

We give below Topinard's conclusions: conclusions which we adopt unreservedly.

Man's Place in the Classification of Animals. Is his Origin single or multiple? His Genealogy. His Future. "It is useless to formulate the proposition which issues from all that goes before: the last chapter in particular dispenses with this. Man is an animal by the same title as the rest, with no more rights than those which are conferred upon him by virtue of the law of the strongest, his physical organization, his physiological attributes and his success in the struggle for existence. His body is of the same substance, he is composed of the same tissues and possesses the same organs. His shape comes from simple variations produced by the force which impels living beings to differentiate. Like every animal, he struggles in eternal renewal: being born, reproducing himself and dying. Such as he was when Gallien dissected the baboon in order to know what it was like, such has he remained, resembling the baboon in certain points, differing from him in others, having the same wants, the same physical sufferings, the same instinctive impulses, the same inner feeling leading him to refer everything to himself. Through the highly developed properties of his cerebral organ, through his judgment which enables him to see things exactly as they are, by his memory which permits him to store up his observations and to draw his deductions from them, by his power of initiative breaking routine, by his ideal conceptions he can by a flight of fancy consider himself as a separate kingdom in the cosmos. But by his body he is and for ever will be an animal, a Primate. None of the characteristics of this group are wanting in him, in particular none of those of the Primates, which we have summed up already, or which we have discovered in them since. He possesses proper characteristics which assign to him a specially favoured place among them; but he commences first with their general characteristics. Someone will say to us: you place man among the apes, beings which are sometimes so vile. Could you not find some more noble animal? That is prejudice and judging from appearances. Apes are by no means disinherited. On the contrary, some of the Ongules, like the Cervides and Equides have attained a high degree in the scale of mammifers. They claim our admiration on account of the perfect adaptation of all their parts to an ideal of existence; their shape is elegant, their progress is at the same time light and rapid, they render us service or contribute to our pleasures; they are the latest efflorescence of a branch which has grown and flourished since the cocene period. Some of the Carnassiers such as the Felides are also the object of our admiration for the perfect harmony of all their organism in relation to their peculiar mode of life; they have strength, nobleness and intrepidity. The Canides besides are the friends of man, undoubtedly, but neither of them possess that which the humble monkeys have: a cerebral type predestinated among all from its origin, already developed in the Papion, the ugliest among them. The brain of the horse, the nearest to the Primates, by its less rudimentary anterior lobe, is gross in spite of its fine circumvolutions, in comparison with that of monkeys in general. Even the skull of monkeys has something human about it, and reflects, as we have shewn, the internal cerebral organ. The brain has evoluted in all its branches from the tree of mammifers, it has numerous circumvolutions at the extremity of certain branches: sometimes the wealth of its circumvolutions even exceeds that of man. But in one branch only, that of the monkeys, has existed from the beginning that which gives a special value to the brain.

"Monkeys are laughed at, without its being observed how marvellously they are organized for their own mode of life. We see them frolicking, grimacing, swinging themselves from one branch to another, indulging in the most astounding feats, like true acrobats. But we do not think that it is exactly the habits and necessities of their existence which have given birth to the organ to which, after the brain man owes the most, that is to say the hand. This hand, which by a strange aberration had abandoned the anterior extremity for the posterior extremity in some marsupials, principally occupies this extremity in the Lemurs. In monkeys it returns to take possession of its most suitable place, gradually to become perfected and to obtain the incomparable apparatus which caused Franklin to define man as the Maker of Instruments.

"The brain, and the cranial type which accompanies it, the hand and its adjuncts, the nails, are the characteristics which produce the privileged situation of those who are rightly grouped together under the denomination of the order of Primates. With some modifications in the proportion of the members in harmony with the attitude and some accessory characteristics, their variations give rise to the divisions which gradually rise upwards until they end in Man.

"Whatever be their relative value and respective distances, they exist five in member, disputed or not, and we recall them to the reader. The Lemurs, regarding which we shall give an explanation, the monkeys of the New World, or Cebi, from which the Arctopitheci are often divided off, the monkeys of the Old World which have tales, the Pitheci, and the ones without tales or Anthropoids, and lastly Man.

"Here is the question which we have put and which has agitated the Society of Anthropology. Are the Anthropoids in this list nearer to the Pitheci and Cebi or to Man? Should we join together in one group: monkeys and Anthropoids, or Anthropoids and Man? It is a question, in some degree, of measuring the interval which exists between Anthropoids and Man, comparing it with the intervals which come between the other monkeys. From the conclusion results the adoption of one of the systems of classification before us, some separating Man altogether from the Primates, in virtue of a special order, others leaving him apart among the Primates in virtue of a sub-order or family, and others lastly grouping man with the Anthropoids. This is a general schedule to draw up; and as the divergences often affect what we look upon only as one aspect of the problem, it is necessary to see them all. This is what we have done. For each group of characteristics we have given our conclusions, and we have now to give only the most conclusive, these concerning the brain and the skull, the appropriation of the body, particularly that of the lower limbs to the biped attitude, and that of the upper limbs to prehension.

"In the general type of brain, we have established the fact that there are characteristics in common as regards the deep structure. We have seen that the type of circumvolutions which is rudimentary in the imferior Primates gradually developing in a thoroughly characteristic manner in the Paponin, absolutely established, according to Broca, after the Gibbon, and becoming complicated as it passes from the Anthropoid to Man, has a characteristic which must not be neglected.

'*Transformation of the third frontal circumvolution.*—Man alone displays the characteristic point of improvement agreeing with the power of articulate speech; the conclusion is, even taking no account of the wealth of man's circumvolutions, that there already exists an important difference through its physiological consequences between him and the Anthropoids and which forbids any bringing of them together on this ground.

'With regard to the size of the brain the conclusion is plain. It is three times as great in man and leaves the Anthropoids with the other apes.

'The consequence of this increase in size which is general, but predominant in the anterior lobes, is the complete transformation of the skull. While preserving some of the characteristics peculiar to the Primates in general, which it has already assumed, it becomes such as we actually know it in man, profoundly different to that of the Anthropoids in all its characteristics, and among others its craniometrical characteristics. The face itself is changed. Everything yields to the supremacy of the organ which, far and nigh, regulates the whole of the human organism and distinctly separates it from that of the Anthropoids.

'The hand is the second fundamental characteristic of man, but a characteristic common to all the Primates, faintly delineated in the earlier types, but becoming more perfect as it proceeds. In monkeys, the forearm assists the hand; in the Anthropoids, the whole of the anterior member unites in the function, and in man it attains its highest point of perfection. Hitherto it was but an instrument for clinging in connection with an arboricular existence, in man it joins its operations to those of touch, sight and muscular feeling and becomes the faithful executor of the orders of the brain. Is there anything more wonderful than than the imperceptible and gradual movement imparted to the screw of the microscope in operations of micrometry?

'The hand therefore brings the Anthropoids and man together, but more in appearance than in reality, remaining in the Anthropoid a brutish instrument for clinching as it is in apes.

"The last characteristic is that of attitude. It is complex in the monkey, analogous in some ways to that of certain quadrupeds, but special in reality. In some, signs are already displayed of the raising of the trunk, as in the Cynocephali. This raising up is more marked in the Anthropoids, but without attaining the erect attitude and really allowing them to stand upon their feet; in them the characteristics of this attitude hardly affect anything but the viscera and the vertebral column; they are inappreciable at the head and are scarcely more marked at the lower limbs, which are lacking in calves, thighs, and buttocks, characteristics of the effort necessary to preserve the erect attitude.

"Contrary to what is said, the Anthropoids are less apt in holding themselves upright than the other Apes. The latter are able to walk on the ground with the foot stretched out, but the Anthropoids cannot do so as readily. The Apes have on their lower limbs, as they have on their upper limbs, a hand which can act as a foot. This hand has been perfected in the case of the Anthropoids for its function of clinging, but to the detriment of its accessory function as a foot; on the lower limbs it turns inwards, so that the foot can grasp the tree by the side, but can only be laid on the ground with difficulty on its outer edge, or else at the same time on the dorsal surface of the toes. The posterior hand therefore forms an abyss between man and the Ape; but between man and the Anthropoids the gulf is still deeper.

"Cuvier's reasoning is perfectly correct. The Apes, and to a still greater degree the Anthropoids, deserve the name of Quadrumanes, on condition that the word *hand* is not taken in the strict sense given to it in the case of man, but in the sense of an instrument adapted to a certain kind of prehension. For us, man alone has two real hands, just as he is the only one among the Primates who has two feet made to support the entire weight of his body in an upright position. If an attempt is made to assert that the Anthropoids are progressing towards a vertical position, it is because a confusion has been made between the characteristics relating to the adaptation of the arm and forearm to the function of clinging and the characteristics relating to the vertical attitude. Take away the former and that which has to do with the straightening of the trunk in arboricular life, a straightening which in no wise implies the verticality of the lower limbs, and nothing of real import remains to the credit of the Anthropoids.

"The other distinctive characteristics of Man and the Anthropoids are secondary and, besides, lead to the same conclusions. The result is that the two groups must be separated in the classification and that the Anthropoids remain Apes."

Summary and Conclusions. "To give a summary regarding Man, Anthropoids and Apes, we will compare the order of Primates to a tree. The Lemurs are only the roots, giving birth to one or more stems. One of these is the stem of the Apes, one of the boughs of which puts forth a higher branch, that of the Anthropoids. Another, of which the point of origin and of contact with the preceding we fail to discover, puts forth the actual human branch which rises parallel to that of the Anthropoids without any relation with it and goes beyond it.

"Has Man attained his culminating point? Is he at the end of his evolutions, or are there any still wanting? Will his be the lot of Palæonthological species which reached their maximum, became stationary and perished? Or will he still continue his progress? Will his success acquire greater keenness? his hand greater skill? Will his brain gain either in size or in circumvolutions, or in the number of its cellules, or in the quality of those cellules?

"For our part we doubt whether the size of the brain will have any notable gain for reasons of the equilibrium of the head and of the harmony of its parts. Its anterior lobes may however increase, until the axis of gravity passes to the very middle of the base of the skull, or a little beyond. It is certain that dolicocephaly will be replaced by universal brachycephaly. What will grow more perfect will assuredly be the qualities of the cellules themselves. On this side no limit is to be seen, and, through them, Man may hope to attain to the Buddhist ideal.

“When he shall thus be raised by means of his intellectual faculties, his latest inferior types will have disappeared, the animals which are nearest to him to-day will then no longer exist, the interval will have increased, the gulf, of which we still perceive the paths uniting its sides together, will be unfathomable. Man, intoxicated with his power and giddy height, will have reason this time to believe himself a creature outside all limits, the centre around which gravitates the Universe, the Sovereign for which all Nature has been created. He will form there a kingdom apart, the human kingdom.

“And yet in the midst of his triumph, his body will always recall him to himself; the Anatomist will always have the right to cry out to him the saying of Broca, hardly modifying it at all: *Memento te animalium esse.*” (*L'Homme dans la Nature*, Paul Topinard. Felix Alcan, éditeur.)

CHAPTER VII.

SOUL AND MATTER.

WHAT IS THE NATURE OF THE DIFFERENCE WHICH SEPARATES MAN FROM BEAST?

Soul and Matter, according to the Materialist School.—Beast and Man.—Man is the only Creature possessing Reason.—The Signs of Reason.—Man has the Power of Speech; he is Free; he is the Master of Nature.—Animals do not possess Reason.—Animals have no Morality.—Man invents, Animals are unable to do so.—Animals do not speak.—Versatility of Human Language.—Animals are incapable of attaining Reason.—Philosophers and Physicians.—Spiritualists.—Definition of the Human Soul according to its proper and distinct Characteristics.—Natural Deontology.—The Soul of Animals.—The Materialist School.—The Evolution of the Moral Idea, by Letourneau.

Soul and Matter according to the Materialist School. According to modern materialist science, man would be nothing else than a perfected animal, in virtue of the great natural Law of Evolution, the first term of which begins in the microzyma and the last ends in man. Everything consists in Matter, and consequently the idea of a Divine Creator or Infinite Power must be considered as a hypothesis which cannot be held in face of the reality of the discoveries of modern science.

The soul of man accordingly would not be of Divine essence. It would be a mere product of the transformations of matter which perishes together with the organized form within which it is contained. The soul of animals, similar to that of man, would be, so to say, the rough outline of the latter.

Are such bold assertions to be admitted, denied as they are by the Spiritualist School which is as old as the Materialist? To thoroughly examine so vast a subject as this would require a work of several thousand pages.

In the appendix we shall be content with studying the question from the only point of view which interests us. We shall merely endeavour to discover what is the nature of the difference which separates Man from Beast, and if there is an impassable abyss between Man and Beast, as the Spiritualists would have it.

Beast and Man. The best work which has been written to defend the Spiritualist ideas is that by the Jesuit, Father de Bonniot. (¹)

In the introduction to his work Father de Bonniot clearly puts the question:

"For contemporary naturalists, man is nothing but a reasoning animal, and a brute is an unreasoning animal. Between these two there is only one difference more or less: man is an animal which is able to reason, and an animal is a man who tries to reason! I have had occasion to read the greater number of works published upon this question during the present century, and I must say that their unanimity is almost complete. The Scientists who call themselves Spiritualists are in agreement with the noisy crowd of Positivists and Naturalists; all of them teaching that intelligence is the same thing throughout the whole animal kingdom, and that the hierarchy which should be established, species, races, or individuals, has no other foundation than the unequal development of a faculty which is identical

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(¹) *La Bête, question actuelle.* Tours, Alfred Mame et fils.

everywhere in nature. M. de Quatrefages however, let us not forget to state, has attempted to assign a wholly separate rank to man. He discovers in him a characteristic which has no part elsewhere in the animate creation, the *religious* sentiment. That is perfectly exact; but the illustrious Professor of the Museum of Natural History concedes at the same time to animals at least a germ of reason; he has not seen that this is to concede also the germ which he wishes to reserve to man. One writer alone, in our opinion, has during this century treated the question which occupies us with the depth of a philosopher and the sureness of a scientist; this is M. Henri Joly whose work, entitled, *L'Instinct*, has justly received the reward of merit at the hands of the *Académie Française*. Since the admirable and too little known pages of Bossuet, drawing his inspiration from St. Thomas to determine with certain hand *the difference between Man and Beast*, we do not think that anything has been written upon this subject superior to M. July's book. The scientific world, certainly, has not remarked it.

"How have Naturalists contrived to blot out the specific difference which, from the intellectual point of view exists between Man and Animals? By a very simple process which causes us to suspect the existence of terrible gaps in the philosophic knowledge of those who employ it. Casting upon man a rapid and singularly inattentive glance, these scientists observe in him only those faculties which are common to him and animals. They persuade themselves that they have seen the whole of man, when they have seen but a half. After that, comparing this half, which they take for the whole, with the brute, they naturally find a perfect similitude, and their demonstration is completed. This mode of proceeding is especially dear to the school of Darwin and to the disciples of Comte; we shall have the opportunity of furnishing the proof of this."

And further on in his Introduction, Father Bonniot thus continues:

"What is really important for us to oppose vigorously is the tendency of contemporary science which desires to make an animal into man, in order to make man into an animal; it is of importance for us to contend against doctrines which compromise not the dignity and immortality of the human soul, but the morality and the destiny of the souls of a crowd of men. Such is the object which we have placed before us. We might flatter ourselves with attaining it, if it were enough for that to arrive at some certain conclusions; for we shall only call principles and facts to our aid, disdaining the easy but useless game of hypotheses.

"Before entering into the matter, we must define some terms which might impede a reader.

"In the course of our work the terms *psychology* and physiology will often be in question. We must not ask for the interpretation of these two words from etymology. Psychology is not only the knowledge of the sensitive soul, as a Hellenist might believe; and physiology is not the knowledge of Nature. A living being, such as man or an animal, is the subject of phenomena of two kinds. Among these phenomena, some entirely escape the external senses, and are only perceived by an internal faculty which, in us, takes the name of *inmost sense* or conscience; others, on the contrary, escape the inmost sense, and are perceived only by the external senses. Desire, fear, love, hate belong to the former; the digestion, the circulation of the blood and respiration to the latter. The former are called *psychological*, the latter *physiological*. Thus the instrument of observation distributes the phenomena of the animate subject into two perfectly distinct classes. But it is evident that, the living creature being one, the two kinds of phenomena must often mingle together and almost coincide. Moreover, the double instrument assuredly acts the double part; the eye, for instance, observes the movement of the hand, which is a physiological phenomenon; and the inmost sense a psychological phenomenon in the voluntary act which has this movement for its object. The psychological phenomena form the material of *psychology*, and the physiological phenomena the material of *physiology;* but while psychology unites the study of the phenomena to that of the immaterial principle from which they proceed, physiology is entirely confined to the operations of the living organism, leaving to another science, that of anatomy, the task of demonstrating and analyzing that organism. Psychology belongs to the province of philosophy, physiology to that of natural history.

“Psychological phenomena do not always have the same characteristics: some are the result of the action of material causes upon the organism, or rather on the organs of the senses; these are called *sensations*, such as *seeing*, *hearing*, *tasting*, etc.; others are formed by the return of these sensations in the absence of the objects which first produced them, and are called *images;* others are inclinations which urge the living being to perform certain movements with his members, and are called passions. All these phenomena have one and the same, principle which the Greeks called ψυχή, and which we may designate by the general name of *sensibility*. The term *sensibility*, however, is employed more especially in speaking of the faculty of experiencing sensations. The *imagination* is the faculty which causes the sensations to revive after having preserved them under the name of *sensible memory*. The *passions*, according to ancient authors are the acts of the *sensible appetite*, which some Greek philosphers have called ὄρεξις and others ὁρμή.

“Above the sensible phenomena are the intellectual phenomena, which, as we shall prove, are the exclusive privilege of man upon the earth. The difference which is apprehended by everybody between *seeing* and *understanding*, between *perceiving* a taste and *admiring* a fine work, shows us, at one stroke, the gulf which separates the sensible phenomenon from the intellectual phenomenon. We cannot find space here for more ample developments.

“The classification which we are following is not arbitrary, but founded on the essential characteristics of the phenomena: it is that of the ancients, as reproduced by Bossuet in the *Connaissance de Dieu et de Soi-même.* It differs notably from that which has unfortunately been propagated by modern schools. The work which we are now publishing would probably have had no reason for its existence if our contemporary philosophers had not first mixed up the phenomena of the sensible order with those of the intellectual order. The confusion of what the Greeks called ψυχή with that which they called νοῦς, of the sensible soul with the intelligent soul, or at least of the faculties of sensibility with the faculties of reason, has preceded and prepared the confusion of the animal with man."

Man is the only Animal possessing Reason. After this introduction, Father Bonniot begins with the study of man. Between the animal and man there is an impassable barrier called *reason*, and reason absolutely differentiates human intelligence from that of animals. It is by reason that man, the most illiterate peasant as well as a member of the Institute, knows that two and two make four, and that this idea is true at all times and in all places, that two and two are never *three*, and that two and two are never *five.*

Man has discovered mensuration. It is imperfect among savages, since a tribe in Oceania, mentioned by Sir John Lubbock (¹), is unable to count beyond four. It is clear that this rudimentary numeration is not to be compared with that of the mathematician who invented the table of logarithms. Be it so, "but to anyone who is able to reflect, the wonderful thing about numeration is, not that a special name designates ten, a hundred, a thousand, nor even a thousand millions; nor even that certain cultivated minds, delighting in the difficulties of numerical combinations, have reached the farthest limits of the calculating faculty, that is of reducing numbers to

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(¹) Lubbock, *Prehistoric Man.*

formulæ; the wonderful thing is that a poor savage should be able to say *one* and *one*, or even only *one*. And, do we not see that *one* and *one* is the root, the foundation, the principle of all the properties of numbers; that the knowledge of *one* and *one*, contains under a general form, the knowledge of all that forms the glory of the greatest mathematicians; that *one* and *one*, the most simple of the operations of arithmetic, is at the same time the most vast as well as the most fruitful? From that it definitely follows that the Tasmanian and the Papuan, in order to say *one*, provided they know what they say, which is not doubtful, make proof not only of as much depth but also of as much expanse of mind, as if they had solved the most complicated problem of astronomy. The Tasmanian and the Papuan, in order to say *one*, prove that they have all the powers of reason, because they know with certitude and clearness, although they do not take account of what it expresses, that *one* is suitable for any object at *all* times and in *all* places; because, owing to this single idea, they are brought in contact with universal and necessary truth. We should easily convince ourselves of this if, by discreetly put questions, we were to endeavour to confine the idea of unity, as it is conceived by a savage, within limits of number, time and space. We should never succeed in doing so; a manifest proof that we are here in the presence of a phenomenon of the purely intellectual order.

"Now, have we reflected upon what is included in these three words, *all*, *everywhere*, *always*, the idea of which we shall find under another form of the lowest degree of human intelligence? How can we exhaust all? A number representing the grains of sand on the sea-shore, the drops of water in the ocean, the molecules of the atmosphere, the impalpable atoms which compose the earth, the sun and all the heavenly globes, would not suffice for it. In the presence of *always*, what are all the instants which have passed away since the first condensation of the nebulous matter which was to become our solar system? Will *everywhere* be exactly measured by the immensity of space in which the worlds move and which the light, travelling millions of leagues in the twinkling of an eye, takes ages and ages to traverse. The *all* that exists terrifies the imagination."

Reason is therefore the property of man. Father Bonniot remarks that man's reason, in spite of its essential greatness, is subject to the conditions of the organism to which it is united. It would be as puerile as it would be inexact to deny it. An original or accidental defect of the brain is enough to prevent or suspend the exercise of reason, according to the nature and extent of the disorder of the organ. Thence comes idiocy and madness of different degrees; thence also comes the argument, eternally the same, of materialism against the spirituality of the soul.

The Signs of Reason. Because man has reason, he *speaks*, he is *free*, and he is master of Nature.

After a rapid outline of the nature of language, the author proves that in order to speak it is necessary to have reason.

"The sign and the signification, the word and the sense are profoundly distinct; the one is reduced to certain sonorous or luminous vibrations, perceived or imagined; the other is no longer an acoustical or optical phenomenon; it is the idea itself, the perception of a universal and necessary truth produced by the written or the spoken word. We have said, in fact, that there is no word in a language which does not relate directly or indirectly to the notions of reason. To speak is, before all, to conceive the universal, and, in the second place, to designate it by a sign. It evidently follows that, in order to speak, it is necessary in the first place to have the faculty which places one in communication with the universal: it follows that, in order to speak, it is necessary to have reason, and that man only speaks because he is possessed of reason.

"But if language presupposes reason, is the converse proposition equally true? Does reason necessarily entail language?

"In the first place, there is no doubt but that reason, developed and self-controlled, can create a language: it is in this sense that it is truly said that words are arbitrary. It is always possible, when men are able to think, to place fresh ideas under a given sign, or to mark such and such an idea by a selected sign. Tribes are to be met with in South Africa which change the greater number of the words in their language every generation; and the traveller who visits them a second time, after a long absence, is greatly astonished at being understood without being able any longer to understand. Reason therefore, when fully exercised, necessarily implies the faculty and the possibility of language.

"Man is gifted with a marvellous facility for speech, properly so called: a proof of this is the prodigious rapidity with which a small child makes himself familiar with the complicated mechanism of a language. Speech is therefore in truth the means prepared by Providence to second the evolution of reason. Indeed, a child does not understand before he speaks; and if, by an unfortunate combination of circumstances, he is unable to learn to speak, his intelligence remains in a state of torpor, and he falls into a condition akin to that of idiocy. We are told of poor children abandoned in deserts, for away from all intercourse with their reasoning and speaking fellow-men. They have succeeded in saving their miserable existence from a thousand dangers, but they have grown up like veritable animals; their intelligent life appeared to be extinct in them.

"Deaf-mutes display the same phenomenon, an instance, alas, which it is but too easy to verify. Everybody is aware that before the language of signs or written language comes to their assistance and takes the place of speech, their intelligence remains nearly closed, or, if it affords passage to any idea, it is because they live in society where speech takes every shape, and ideas are expressed by gestures, attitude and look, and because these mute expressions have begun to draw them out of their native torpor.

"*Liberty*. The second sign of reason is liberty. Man is free because he is possessed of reason.

"Man is free because he has the power of choice; but in order to choose, we compare the objects of choice, and, in order to compare, we judge. Choice or the act of liberty is therefore impossible, if it is not preceded by the act of reason which is called judgment. All judgment, it must be remembered, includes at least one universal idea. The property that I affirm or deny is necessarily one of those ideas which are common always and everywhere to an indefinite number of individuals. The thought of reading, for instance, comes into my mind: immediately I judge what advantage there is in reading, and what advantage in not reading: instruction, if you will, on the one hand and repose on the other; which I formulate thus: reading is instructive, not to read is agreeable. Instructive and agreeable belong to those ideas which neither time, nor space, nor individuals exhaust; ideas which belong properly to reason. It would be the same in any other case. How then is it possible to be free, if we do not possess reason?

"And reciprocally, liberty presupposes reason, and reason infers liberty. Owing, in fact, to its nature, which consists in the power of *understanding*, reason when in presence of an object sees at the same time what it is and what it is not. It is impossible for me to understand what it is *to read*, if, at the some time, I do not understand what it is *not to read*. Consequently, reason must necessarily disclose to the reasoning agent the *pro* and the *contra* of any action which presents itself.

"Liberty, in its turn, produces effects of which account must be taken. Man is free, therefore it depends on him to perfect himself; for the perfection of a creature follows the repetition of acts conformable to his nature. He is free, therefore he is moral and responsible, capable of merit and of demerit, of good and evil, author of his own honour and his own shame. He is free, therefore he has duties and rights; duties, because it is forbidden him to abuse his liberty for evil; rights, because among other free creatures, none is able, without violating nature, to impair his liberty."

Man—the Master of Nature. "Three words, as we have remarked, characterize the very act of reason: *everything*, *everywhere*, *always*. Now, *every creature* is contained in *everything; all time* in *always; every place* in *everywhere*. It follows that every time reason grasps an object, it comprehends at the same time and by the same act; that the conditions of this object are possible and realizable in any other object, in any other time and in any other place; and that this follows an indefinite processus. It is impossible to say where this possibility stops. This appears very simple and perhaps insignificant; nevertheless it is the source of the sovereignty which man wields over himself and over all creation. By virtue of this property of his reason, man cannot be but king. Some examples appear necessary in this place."

Father Bonniot gives as examples: 1st, the discovery and the use of fire by man, which no other animal has hitherto been able to do: 2nd, the conquest of agriculture and the management of flocks brought together as a reserve of food under the hand of man: 3rd, the creation of a shelter against the vicissitudes of the climate, the starting-point of architecture.

"We should have no difficulty in accumulating instances, but the result would be always the same. It is more difficult to explain how man, with his reason, would not have been the master of nature than to show in this faculty the principle of his necessary sovereignty........ To sum up: man is in constant relation with necessary and universal truth. The power which he possesses of knowing universal and necessary truth is designated by the name of *reason*. Reason, which is not exerted without *language*, is a princeple from which necessarily proceeds *liberty*, and with liberty, *the sovereignty of Man over Nature.* Shall we find anything analogous in animals?"

We have largely quoted from the portion which treats on Man and which comprises only the first two chapters of Father Bonniot's work. It will be understood that with regard to the part which concerns animals, in the three hundred pages which follow, we are compelled to give a very brief summary of the author's arguments.

Animals do not possess Reason. He begins by establishing the fact that animals do not possess Reason. He defines *instinct*, an unknown principle by which every animal performs a number of acts in which understanding can evidently have no part. Naturalists of every school, Spiritualists and Materialists, following the lead of Frederic Cuvier, distinguish instinct from intelligence. Now, of what nature is the intelligence of animals?

"When we wish to analyze the psychological operations of man, one of the greatest difficulties consists in *isolating* the sensible element from the rational element. Of an essentially reasonable nature, man acts with his entire nature; and reason always more or less has a share in his operations. It is quite the contrary with regard to animals: the difficulty does not consist in getting clear of the continual intermixture of reason, but in selecting here and there some striking act which has some appearance and shadow of reason. Read everything which has been written by the most specious advocates of animals, and you will be surprised at the small number of facts to which they appeal. They may perhaps amount to twelve, but it is very doubtful if they exceed twice that number. That is sufficient to prove in the most conclusive manner that the interpretation of these facts is inexact. A living faculty manifests its existence by its operations: a living faculty which is met with in hundreds of millions of creatures and which displays itself only a dozen times, is an absurdity."

"**Man invents, Animals are unable to do so.** Man is an inventor. He has formed the tools with which he has been able to accomplish works which his hand, in spite of its suppleness, was incapable of performing, from the blacksmith's hammer to the writer's pen and the painter's brush, three instruments which date back to the very earliest times. Among animals, on the contrary, after observations of sixty centuries, it has been impossible to verify a single case of invention. Each animal invariably follows the line peculiar to its species without ever deviating from it, unless man intervenes and by *training* modifies by his reason the impulsion of nature. In the race they all have one and the same way of procuring their food and of defending themselves, a way which has not varied for 6000 years. The lion always pursues his prey by open violence; the wolf and the fox take theirs by craft. But no wolf has thought of forming a kind of sheepfold for his use, any more than a fox has had the idea of making a poultry-yard. They would have nothing to invent, they would only have to imitate man. Animals will die rather than deviate to the slightest degree in the world from the habits imposed by their species.

"In the same way for their defence, animals make use of their natural arms and always in an identical manner. The complicated works of bees and of certain kinds of wasps, veritable works of art and science, are so by virtue of instinct in an identical manner, without ever having varied since the most distant epoch of time.

"Our ancester, the cave-dwelling man, was not even acquainted with the art of making a hut: his discendants, after building wonders in stone like the Gothic Cathedrals, have constructed the Eiffel Tower and the steel viaduct of Garabit."

Animals have no Morality. "There is no morality in the animal, or what is the same thing, no liberty. And certainly, we have some reason to felicitate ourselves upon this; for, as we have said, liberty essentially produces right. If animals were free, they would have the right to be respected in their independence and above all in their existence; or, in other words, man would be compelled to live upon vegetables, unless at least he preferred to die of hunger. This consequence, it will be confessed, is not devoid of importance."

Animals do not speak. "Must I now prove that animals do not speak? At the end of the last century, an original genius to whom scientists still accord some importance, Dupont of Nemours, took it into his head to learn the language of crows and nightingales. He succeeded in deciphering, at least he believed so, four of the crow's words. More fortunate with the nightingale, he translated into lyric verses the joyous song of the sweet singer of spring. But Dupont of Nemours unhappily made no disciples, and his method perished with him. Outside the *Arabian Nights* we come across no privileged mortals who understand the language of beasts."

Animals cry, they do not speak. Beyond man, there are only mutes. The cry is a spontaneous effort by the movement of certain organs, caused by an emotion of the sensibility and designed to produce a corresponding emotion in another sensible individual, by means of the sense of hearing; it is included between two states of sensibility: for instance, the pain of one part and the sympathy of the other. Thus the cry of pain of a wounded animal which produced an emotion no less spontaneously, in its congener which hears it; for instance, an impulse which urges it to flee, or a kind of attraction which leads it to come and help its fellow.

"The cry, as we have said, proceeds from a sensation and ends in a sensation. Language comes from an understanding and induces an understanding. Cries and language therefore belong to two different orders of phenomena, and it is a wrong argument to infer the second from the first. And yet we have no other reason for conceding to animals the possession of speech." (Le Père Bonniot.)

Even granting that the cries of animals constitute a language, their vocabulary would not be rich, and among the more intelligent quadrupeds (the ass, the horse, the dog, the cat, etc.) it would not be composed of more than four or five words at the most, which would correspond only to as many ideas. Between that and man's reason, there is an abyss!

Versatility of Human Language. "If a language is necessary to reason, such and such a language or such and such a word is assuredly not so. Nothing is more versatile, more flexible or more changing than words; they are essentially arbitrary. This is why languages vary from age to age. It is no more possible to prevent this transformation than it is to compel liberty always to manifest itself under the aspect of uniform acts: uniformity and liberty are contradictory terms, almost as much as night and day. There is only one means of fixing a language, and that is no longer to speak it. The fixed languages are the dead languages.

"The cries of animals have never been a living language; they have never undergone those modifications which are the sign of the peculiar life of languages. The horse neighs, sheep bleat, the bull bellows, the thrush whistles, the rook caws, and the bee hums in our fields to-day with exactly the same intonations and the same notes as they did ages ago in Noah's Ark. None of these animals, nor any other, has ever had the thought of attributing any new signification to the cry of its species. Undoubtedly, man succeeds in modifying, whether for good or ill, the voice of certain individual animals by his own voice; but we know that the imitation is only superficial. The chattering of a parrot or a magpie is devoid of sense, just as the turning of a barrel-organ is devoid of sentiment. It is said, however, that the dog in the state of domesticity has acquired the art of changing the howl of his race into a bark. If this constitutes a progress in language, it is very slight since the prehistoric time when it occurred: it will be admitted that since then this language, if it is to be called by that name, has been fixed and unchanged in spite of the very variable positions of the individuals who use it in the drawing-room, in the stable, in driving flocks, or in hunting. We must conclude that if the dog has a language, it is a language in which reason has no share."

Animals are Incapable of attaining Reason. "If animals do not possess reason, what then remains to them? There remains to them that which the ancients called the sensitive part of the soul; there remains to them the power of experiencing sensations through the senses, and of retaining and reproducing them through the inmagination, and the power of feeling passions, that is to say of acting under the impulse of the sensations which are experienced and reproduced. They see, hear, smell, taste, feel pleasure and pain, they seek what they like and avoid what they fear; in a word, everything is to be found in them, in different degrees, that has been found in man: *except reason.*

"It is possible to reconstruct the animal by aid of the phenomena which we observe in ourselves, if the the greatest care be taken to eliminate all the rational element: a thing, we may remark *en passant,* which demands a habit of psychological analysis. The best philosophers concede to animals a kind of understanding. It is hardly possible, in fact, to conceive a sensation, an act of the imagination or sensible appetite, without a kind of blind and irreflective understanding. Nevertheless, it is to be regretted that the name proper to the act of reason is applied to the exercise of the sensibility: this, I believe is the origin of the confusion which we are attempting to unravel at this moment.

In order to form an idea of the kind of understanding which includes sensation, we can have recourse to a very easy experiment. If we produce in ourselves a somewhat lively sensation, and at the same time direct our attention to another object, the sensation is still experienced; but it is, in a sense, isolated from the reason, for the reason follows the attention. And now, give more intensity to the consciousness of this sensation, without giving it another direction or more clearness, and you will have reproduced, in my opinion, the purely animal phenomenon."

Taine derives all man's faculties from sensation. De Bonniot is of opinion that this thesis applies, not to man, but to animals, and he puts the question in the following terms. "Is it possible that through successive progresses, the brain of animals can reach the perfection of that of man? Does not the sensibility depend in the closest way upon the nervous system, so that it follows its development and weakening? Has not the reason itself the exercise of the sensibility as the condition of its own operations? I do not wish to know anything of it at present. I only wish and hope to prove that in spite of all the perfections of which it is susceptible, sensibility will never be able to become reason."

We pass over Father de Bonniot's metaphysical argument in order to arrive at his conclusion. The senses have nothing in common with the intelligence, and in relation to the senses animals are better endowed than man, particularly with regard to the hearing, the sight and the smell. Deaf-mutes and those who are born blind have a far smaller share than the rest of mankind, but their intelligence supplies what is lacking in their senses, and an unfortunate creature, deaf, dumb and blind has been known to reach a surprising degree of intellectual development by means of the sense of touch alone, converse with her teacher through a system of touch, sew, and thread her own needle. What could be done with an unhappy dog that was deaf, dumb and blind from birth?

"There are scientists who will try to fall back on the difference of the brains. This is a false manœuvre. Give an animal a brain as perfect as that of man, and, if it has only sensibility, its brain will never raise it above the condition of the brute. The imagination, as we have said, is only a store-house of images. But sensation is not reason; therefore the imagination, even when lodged in the most perfect brain, is not reason any the more for that.

"As for the brain, the opinion which I hold respecting it is as follows: The operations of the reason are of almost infinite variety: on the other hand, they have for their origin, for their object, or at least for the conditions of their exercise, the operations of sensibility: it is necessary therefore that the reason should have at its disposal an instrument which can, with great facility and precision, reproduce, combine and vary the sensations in thousands of ways, and adapt them, so to say, to the nature, the multiplicity and the promptitude of its special acts. But the most perfect sensibility can no more produce a reasonable art in this instrument of the reason than the most skilful whistler, by using his whistle, can produce a musical phrase of a perfectly constructed organ.

"And so animals, more perfect than man with regard to the senses, have not even the shadow of reason. Consequently the senses and the reason belong to two different orders; and consequently, in spite of all their ulterior progress, animals will never be able to pass the barrier which separates them from us. I do not know if I am under an illusion, but it seems to me that these consequences are of the outmost importance. Let us be perfectly tranquil: never will a chimpanzee, or gorilla or elephant or dog make its way into our ranks."

Spiritualist Philosophers and Physicians. We must necessarily pay attention to the appeal which Father de Bonniot makes in his Conclusions to the lights of the Fathers of the Church. But there are not only theologians in the Spiritualist camp, there are also Philosophers and Physicians, and those not of the lowest rank. Let us quote some of the principle of them.

At the head of them we meet with Hippocrates, the Father of Medicine, with Socrates, the Philosopher called the Wise, with the divine Plato and the learned Aristotle, with Philo of Alexandria, and Galien the physician, and master of Marcus Aurelius, the Emperor-Philosopher; then, after an unlucky time for science, during which the Spiritualists were represented by the theologians, Augustine and Saint Thomas being the foremost, we come to the Chemist, Van Helmont, who again took up the spiritualist idea and created *animism* by the invention of *archei*, of ferments and direct intervention, and experimentally of the principle of life in the inmost movements of the body. Next come the famous Descartes, to whom animals were merely machines; the philosopher Leibnitz; Claude Perrault the architect, who gave to animals a sensible soul; Stahl, the Physiologist; then in England, Glisson, Professor of the University of Cambridge; and Haller the Physician; in France, Barthez was the chief of the Animist School of the Montpellier *Faculté de Médicine*, and Bordin and Béchat admitted the *vital properties* of each organ and directed the medical researches of the Paris School into this path.

In our own times, the spiritualist idea has been defended by Paul Janet of the Institute, and by Henri Joly, (whose work, *De l'Instinct*, was crowned·by the Académie Française). Lastly, almost alone against official science, Dr. Edouard Fournier has written his *Essai de Psychologie—La Bête et l'Homme*. We shall quote from this fine volume only the conclusions of the Fourth Part *(Constitution de l'Ame)* under the heading of Chapter III.– *Definition of the Soul according to its proper and distinctive Characteristics.*

"According to the preceding outline, the fundamental powers of the soul, that is to say the powers which represent its very essence and distinguish it from all that is not it, are three in member:

1. Perception of the sensible and intelligent.
2. Movement of the material of the body.
3. Acquisition and conservation of knowledge.

"These powers are irreducible; they include in power all the modes of action without exception, and particularly those which under the names of *conscience*, *thought*, *reason*, *will*, had been considered up to the present as the fundamental faculties of the soul.

"After bringing together all the elements of a good definition, we shall say:

"The principle of life in its relation to cerebral matter, to the organs of the senses and to the organs of movement bears the name of Soul.

"In these conditions, that is to say in so far as it is united to the body, the principle of life displays in the brain powers which it does not show in any other organ: it perceives the sensible and the intelligent, it acts upon the material as its motive-power, and lastly it retains in order to utilize them as opportunity may offer, the results of its activity.

"These results are *sensible* ideas and *intelligent* ideas.

"Such is the soul, a sensible and intelligent principle, a motive-power and capable of laying by results for its own activity.

"The manifestations of this soul are subject to laws which themselves are the result of the union of the soul with the body. From the moment that the soul is united to the body, its manifestations depend upon physiological conditions.

"Through the wants which induce its activity, the soul is chained to matter until the day when the latter has become incapable of life and thereby destroys the bonds which tie them together. Through its various modes of functional activity the soul takes its flight; it becomes *one*, *conscient* and *reasonable*, and in the sublime world which it creates itself, it can say, but there only, that it is *free*, *independent* and *immaterial*.

"The soul which we have just depicted is essentially, free and responsible. To these two attributes we might add a third: *equality*, if each of us took care to compose his soul in the same way.

"This equality extends only to the instruments which have been put at our disposal, and, let us acknowledge, the justice of the Creator could go no further.

"The principle of life is the same for all; the instruments are equally the same as regards their number, and, if the quality of the material which composes them undergoes more or less of the modifications entailed by diseases and hereditary transmission, we know that by education, instruction and labour, the will of man is able, up to a certain point, to equalize these conditions of our material nature.

"Each one is free in fact to make of his soul such as he intends it; each one is free to accumulate in himself the intellectual acts which enable him to place his soul on a level with those of the greatest genius; and lastly, each one is free to regulate day by day the exercise of his function in the direction of virtue and in such a way as to form his soul by essentially moral acts.

"In a word, man is the fashioner of his soul; and this must be understood in the fullest sense. This soul is born and developes with the body; it begins to obtain a knowledge of itself and to assert itself after the child has acquired the indispensable instrument of language, and, starting from this moment until the time of death, every act and every thought is a constituent element of the soul."

Definition of the Soul according to its proper and distinctive Characteristics. Dr. Fournier endeavours to show that these characteristics of the soul are the following:

1st. The Soul is distinguished from the matter of the body by its sensible activity.

2nd. The Soul perceives the sensible and the intelligent.

3rd. The Soul is a motive principle.

4th. The Soul is a principle capable of acquiring and retaining knowledge.

Having laid this down, let us give *in extenso* the last pages of Dr. Fournier's work, pages which give a complete summary of it.

"The memory is the immediate consequence of the power which we have just pointed out (of acquiring and retaining knowledge): it is to the power what the intelligent idea is to the intelligence. Consequently, the memory should not be considered as one of the fundamental characteristics of the soul; it is simply a mode of activity, and not a fundamental power."

Natural Deontology. "All human feelings and all the truths which concern man are inscribed in his organization, and it is only by tracing them back to their real origin that we can observe them in their true simplicity.

"Man no more invents the idea of God, of the soul, of right and of duty, than he invents the bile or the saliva: he finds all that in him, and not as things which can be or not be, but as things which absolutely must be: they are necessary conditions of his existence and he is obliged to undergo the manifestations of them. If at times the book of nature, generally so little read, is read amiss, it is because the language in which it is written is not accessible to everybody, and this is why we are going to try to translate its principal passages.

"Man moves and acts only under the influence of impulses. All these impulses are, without exception, organic wants. To be acquainted with these wants, their number and their nature is the first duty of man. By this knowledge he arrives at the assurance that there are some wants which induce him to concern himself with the maintenance of his life and with the development of his faculties by labour; others which raise him towards God, and others lastly which attract him to the society of his like.

"We are not free to feel or not to feel the impulse of wants; their voice is heard necessarily and in spite of us.

"The negation of these voices of nature is a revolt of man's pride; but it is insensate, unheard-of pride, which one day finds its master in that very matter from which it proceeds.

"The wants are therefore implacable and necessary in their manifestations; this necessity causes the obligation of their satisfaction to be already felt.

"To all these wants, without exception, correspond functions intended to satisfy them. To know these functions, to study them and to discharge them for the purpose for which they exist, such is the second duty of the soul. By discharging this duty, man places these wants of life in the best conditions of satisfaction; he keeps his organs in a state to fulfil their physiological destiny; he raises his soul towards a creative idea; he has intercourse with his kind, and finally he acts according to the views of God.

"With the object of assuring, in a manner attractive to man, the satisfaction of all his wants, a sentiment of pleasure has been attached to the exercise of every function. This sentiment plays a great part in life; the man who seeks for it in view of the satisfaction of the want to which the function corresponds, conducts himself according to the laws of nature; he who seeks for a functional pleasure, not with the object of satisfying a want, but with that of tasting a pleasure, is a vicious individual and acts wrongly according to nature, because he turns the functional movement away from the object for which it has been created; and lastly he who voluntarily makes the sacrifice of functional pleasure to God, to his like, or to himself, is a virtuous man.

"To know all his wants and to give them satisfaction by functional movements according to the views of nature, that is to say in the way of virtue and never in that of vice; such are the general duties of man, considered in his own individuality.

"There are other duties which proceed from the relations which are gradually established between man and God, and between man and his fellows.

"1. In a general manner, the functional movement developes in us the agreeable sentiment which makes us find life good from the physical, intellectual and moral point of view, in spite of the miseries with which it is spread. As God alone, in giving us life, could have added this sentiment to it, it is to Him that we ought to pay the homage of our recognition, and this recognition is laid upon us as a duty. The man who makes the complete sacrifice of his functional pleasures to the Divinity, practices the chief of all the virtues, that of self-denial.

"2. The functions of the individual ought never to be performed to the detriment of other individuals, either in a direct or in an indirect manner. This obligation is a duty; it becomes a virtue when the man directs the whole of his functional movements in the way of devotion and charity towards his fellows.

"It results from the two duties which we have just pointed out, that the sentiment which accompanies every functional movement can only be legitimately agreeable on the condition that it is good in the sight of God, and just according to what we owe our fellows.

"From the above, and considering, either through the perception of the sentiments of want and of duty, or through the whole of the functional acts intended to satisfy or fulfil the latter, we can sum up natural deontology in two words.

"1. To know the origin and the nature of the wants in order to practise the duties which result from this knowledge.

"2. To appreciate the moral object of the functional movements; to take account of the vicious or the virtuous nature of the sentiments which accompany the functional exercise and to arrange so that the accomplishment of the functions is not opposed to the accomplishment of the functions of other individuals in what is natural or legitimate for them.

"The physiological analysis which has just been read, it is hardly necessary to say, has no pretention to encroach on the teachings of morality and theology.

We have no other object in publishing it than to show to our readers the physiological origin of certain ideas which appear very complex when considered in the elevated spheres in which they have hitherto been maintained. We hope that after reading this, psychologists themselves will admit with us that the starting-point of all these ideas is in man and that it is in physiological man, that is to say in physical and moral man, that they must be studied. Besides, it is easy to be satisfied that in pursuing a different path we have arrived with them at analogous results.

The Soul of Beasts. "After the definition which we have just given of the soul, we might dispense with a discussion of the question, which is at least a strange one, of the soul of beasts. Beasts have no soul, for the simple reason that that which alone constitutes the soul is not in them. The soul in fact is something conscient, free and reasonable; apart from these conditions the soul has no reason for its existence. Animals have neither intelligent consciousness, nor liberty, nor reason, for they do not possess intelligent ideas and they are deprived of language, consequently they have no soul.

"In imitation of the ancients who under the name of soul, designated the principle which maintains life in men and in animals, we might strictly designate by the same word the principle of the life of beasts. But this application presents inconveniences. The human soul is a soul only because it has accumulated, under the form of acquisitions, a considerable number of ideas and acts. It is in this very constitution that we find the least contestable proofs of its immortality. Now what are the acquisitions of an animal's soul. The animal has eaten, has drunk; then it has reproduced itself, and lastly it has slept. Are these acts which enable it to aspire to immortality? We do not think that the principle of life of animals is immortal. Only the acts of the human soul are, in our opinion, immortal. Let us therefore keep the name of soul for the principle of the life of man alone.

"Being desirous of deciding scientifically a question the solution of which was hardly possible at the time when they lived, Descartes and Buffon were led to adopt the automatism of beasts; but it is easy to see, when we read these great thinkers, that this invention proceeded far more from sentiment than from knowledge. Their deep knowledge was able to see the truth, as is proved in several passages of their writings; but, as this truth was neither demonstrable nor demonstrated, they would make no use of it and preferred to let themselves be carried away by the exigencies of the system they had adopted: in order to have the right to give a soul to beasts, they adopted the automatism of brutes. This regrettable exaggeration has been followed by a lively reaction which first manifested itself in the domain of philosophy under the form of materialism, and, a little later, in the domain of natural history under the form of the transformation of species or the doctrine of evolution.

"Lamarck, the chief of this teaching, laid all the foundations of it. His successors, and Darwin in particular, have developed this conception with much patience and art, but the material idea which is at the bottom of this system is no more solid than on the ground of philosophy and physiology.

"It must be thoroughly understood that the materialist idea has an incontestable advantage over all the rest: it simplifies and places within the range of all, the most difficult problems of science.

"In physiology we have seen the problems of cerebral life replaced by a word: by the properties of cellules.

In natural history, it is quite as simple: it replaces the immense question of the immutability of species and the no less complicated one of the origin of man by another word: by evolution.

"This euphonious word replaces things eminently difficult to attain:—was not that one of the reasons for the popularity of the system? It replaces among other things the whole of physiology, and the physiology of the brain in particular. Is it possible, in fact, to reason judicially on the possible transformation of species, if the generally laws of physiology are not known?

"Darwin does not appear to have any doubt about this necessity, and he proves it completely when he says: 'I also shall not try to define instinct.' I quite believe it. If Darwin had been in a position to define instinct, he would not have been able to think for one moment that instinctive sensibility, the principle of the animal, could be transformed into intelligent sensibility, the principle of the life of man.

"Monkeys never acquired intelligence because they were monkeys, and they have not been able to invent, because in order to invent it is necessary to be intelligent.

"Only man invents.

"The peculiar characteristics which so completely distinguish man from beasts have been the subject of our deep study.

"Far from defining *a priori*, as is the custom, the instinct and the intelligence, we have submitted to our analysis the motive manifestations of these principles, and it is only after this analysis that we have brought together the characteristic elements of a good definition. All these elements, moreover, are summed up in the scientific determination of the *sensible idea* and the *intelligent idea*."

Essai de Psychologie, Dr. Edouard Fournier. Didier et Cie., Editeurs.

The Materialist School. The Materialist School is not so ancient as that of the Spiritualists. The earliest member of it is the philosopher Democritus who is criticized by Plutarch the historian, then, in order of date, the rhetorician-physician, Asclepiades, who adopted the theories of the philosopher Epicurus, his predecessor. Asclepiades gave rise to the medical school of the *Methodists*, represented by Thémison, Soranus, Cœlius, Aurelianus and Celsus.

After the Middle Ages, Sylvius de la Boë, a partisan of the ideas of Paracelsus, founded chemical medecine, the adepts of which were called *chimastri*. At the same period, physics also had an influence over medecine. Borelli, Baglivi, Philippe Huquet, Keill, a Scotch physician, and George Cheyne tried to explain the movements of the living body by mechanism; but they all, together with Descartes, made the reserve of the existence of a principle of motion; in other terms, they made the reserve of Pascal's *chiquenaude* (¹). It is useless to follow the materialist idea everywhere where it has appeared since then; besides it is mixed up with many spiritualist conceptions, without the authors of the latter being aware of it.

We will say a word regarding Locke, who was more of a sensualist than a materialist, but whose works have exercised a preponderant influence over the works of the 18th century from the point of view of the materialist idea.

"We have not a sufficient knowledge," said Locke, "of the properties of matter to have any right to affirm that the faculty of thought forms no part of its unknown properties. To assert that God cannot give the faculty of thought to matter, is to mutilate and restrict the infinite power of the Creator." (Locke, *Essay on the Human Understanding*.)

Less scrupulous than their master, Locke's disciples have drawn all the conclusions of this way of looking at it, and opened the way for the modern Materialist. Condillac, Ch. Bonnet, S. Gravesande, d'Alembert, Condorcet, Helvetius, La Mettrie, Priestley, Cabanis, etc., are disciples of Locke.

"If we investigate," says Vacherot, "the antecedents of the Positivist School, we can go back to Locke and even to Bacon. But this is only an origin common to all the experimental school which bears the names of Adam Smith, Reid, Hume, Bentham, Stuart Mill, or Littré. The real father of the new physiological school is Hume. If it takes its method from

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(¹) Fillip.

Bacon, it is from Hume that it borrows the principle of its theory of the phenomena of moral life." (Vacherot, *La Science et la Conscience.*)

At the present day, the materialist idea, supported by the Positivism of Anguste Comte, serves as a banner and guide for a somewhat numerous phalanx of scientists, among whom are many physiologists. We have given the names of the principal in the preceding chapters. Let us merely recall the names of François Claude Bernard, Brocca and Littré, and among the Germans Büchner, Maleschutt and Liebig. The Russians have lately come into the movement with Prince.

To give a summary or even a mere sketch of their works would be going too far. We shall be content with remarking that official French Science (Medicine and Natural History) is unreservedly naturalist. And it will be enough for us to give here the opinion of the learned Letourneau, General Secretary of the Anthropological Society and Professor of the same body, who has published numerous works among which we will mention: 1st, *L'Evolution du Mariage et de la Famille*, 2nd, *L'Evolution de la morale.* Quotations from the former will shew us the arguments which materialism urges against Spiritualism.

The Evolution of Morality, by Letourneau. It is in the preface of a work that the author usually makes us acquainted with the mother-idea in accordance with which the book is written. Letourneau follows this almost invariable rule. He begins by establishing the fact that: "Long ago philosophy was clearly separated from science. Purely theological or metaphysical, it had nothing in common with observation and science. Some abstract conceptions, *a priori* certain alternations of the simple animism of primitive times formed its foundation." Having laid this down, he indicates the progressive march of free thought, which had not the least place in the system of ancient societies where "an all-powerful monarch crowned the edifice, and when he was not more or less deified, he was the terrestrial representative of God on earth." He shows that the thought of the numerous generations which have preceded us in life was born as it were in chains: the long training undergone by our ancestors has impressed its mark upon us, and thence, in the majority of brains, there is a certain restiveness against progress and, above all, an inclination to believe without examination what the human race has for ages looked upon as undeniable truths. Among them Letourneau ranks the classical teaching of all religions, "that there exists in the soul of every human being, to whatever country and whatever race he belongs, innate and necessary moral ideas, which ought to regulate the conduct of life. However, observation shews us that no idea can be innate, but that there are hereditary inclinations, the origin of which we can discover.

"Numerous patient observations have rendered us ſamiliar with the physiology of animals, of children, savages, lunatics and criminals. The doctrine of innate moral ideas vanishes away in front of this inquest."

CHAPTER VIII.

THE MORAL AND SOCIAL EVOLUTION OF THE HUMAN RACE PROVED BY LIVING PREHISTORY.

The History of Civilizations.—The Doctrine of Evolution ought to be applied to it.—Summary of Prehistory.—Its different Phases.—The Prehistorical Period belongs to the Neolithic Age.—The Lake-dwelling of Historical Times.—Analogy between Prehistorical Industry and Habits and those of Contemporary Savages.—Anatomical Analogy between Prehistorical Races and Savages of the present Day.—Contemporary Prehistory.—It throws a Light upon past Prehistorical Periods and the Social Evolution of the Human Race.—Evolutive Psychology.

The History of Civilizations. The Doctrine of Evolution ought to be applied to it. *The History of Civilizations* is nothing else but the social, moral and intellectual evolution of the human race. He considers that to compile this history, relying solely upon historical sources, "is to pluck the flower without thinking about the stalk and the roots.

"This imperfect method having been adopted, great thinkers have applied it with brilliant success. But during very recent years, a great doctrine has originated, the doctrine of evolution, which is destined to renovate every branch of human knowledge. From it has resulted a fresh method which, directing its attention to roots and origins, follows through time and space and carefully notes the evolutions of things and of living beings.

"The origins and earliest phases of civilizations throughout the whole world and in every race, are still very imperfectly known, and yet how much light they throw upon the former phases which necessarily preceded them! To give an idea of this it will be sufficient for me to draw roughly the picture of the primitive civilizations of former times and to compare it with actual and contemporary primitive civilizations: in a word to compare dead prehistory with living prehistory."

Summary of Living Prehistory. In the first lecture the author draws a rough sketch of the primitive civilizations *of former times* and compares them with *actual contemporary* primitive civilizations, in order to draw from this comparison deductions of a conclusive nature.

He takes man at the quaternary period during which his presence upon the earth is now proved. He was a man, but a man in the lowest degree of savagery, having for his arms and for his weapons only stones, rudely broken at first, and afterwards shaped. Almost always a nomad, hunting in the great forests full of game, and the molluscs which he picked up by the sea-shore provided him with his principal diet. Later on he became acquainted with the stone-hatchet with its rude handle and wooden spears. "For a long while the shape of these wrought flints varied but very little, since the primitive man, called *Chelléen*, by M. de Mortillet, seemed to have only known how to fashion a single stone instrument of the most rudimentary shape." But the primitive dweller in Europe of that period knew the use of *fire*, and this discovery, the greatest hitherto made by the human race, dated from the precursors of the tertiary period.

"There was no fixed dwelling. They dwelt where they could, in grottoes, in shelters under the rocks, but seldom in caves which were often the lairs of powerful members of the Carnassier and Feline tribes with which primitive man, ill-armed as he was, would not have liked to measure himself of his own accord."

Its Phases. "But this savage, though his condition was not far removed from that of an animal, was the result of a lengthy and slowly progressive evolution. He gradually altered the shape of his flints and manufactured pointed instruments, saws and scrapers which enabled him to strip the bones and scrape the skins, when the climate compelled him to clothe himself. Besides, until the glacial period, he must have been habitually naked, since, even at the end of the quaternary period a drawing from *Langerie Basse* gives us the picture of an auroch-hunter still in a state of complete nudity.

"But at this period of his evolution, the intelligence of quaternary man was already considerably enlarged. In the first place, he had grown skilful in shaping his stone instruments. These were made pointed at both ends: moreover the idea had occurred of substituting, in a number of cases, for stone the bones and horns of animals, materials which lent themselves to a more varied and delicate style of workmanship. The barbed harpoons of this period, found at the Madeleine, are weapons formed with some skill, and the grooves which have been hollowed out at their points seem to indicate that the art of poisoning them was not unknown.

"Beginning from this period, quaternary man, less defenceless in the struggle for existence, had some respite and leisure for thought, and he profited by it to take a long step forward *intellectually*. He became an artist and created the graphic and plastic arts."

"He also learnt how to adorn himself and became acquainted wlth the art of manufacturing colours with coloured mineral substances with which to *paint himself*. Besides this he wore drilled shells and the perforated teeth of animals as ornaments for his ears, neck, and waist.

"The affective faculties of this primitive artist were certainly but little developed, for, knowing nothing ot any kind of funeral rites, he abandoned his dead as the animals do."

"On the other hand it may be affirmed that he was as devoid of imagination as he was of affection. In fact, among the products of his art nothing has been found which had a religious character, which perfectly coincides with the habit of abandoning the dead in the same way as the beasts.

"Such an existence and such a level of mental power are evidently incompatible with a complex social condition, and it may be affirmed that the fossil man of Europe lived in nomad hordes, very small in numbers, in the same way as contemporary anthropomorphic apes.

"Quaternary man, in consequence of geological and climatic changes which brought with them alterations in the nature of the fauna, seems to have disappeared from some of the regions of Europe and to have been replaced, after assuredly considerable lapse of time, by a successor who was at the same time superior and very different.

"The latter is no longer an artist, but he is a potter, an agriculturist, and possesses domesticated animals. He knows how to construct artificial grottoes. He is buried in them after his death, but must have frequently inhabited them during his life-time. He begins to have religious sentiments, for he has amulets and fetishes."

The Lake-dwellers. "Among the tools and weapons of neolithic man, the stone hatchet played a considerable part. He knew how to polish it and to give it a regular shape. Nevertheless, he made use of the bow, and manufactured arrows of elegant design. His progress grew more rapid and at the end of the neolithic period, that is to say at the dawn of historical times, he no longer dwelt in caves, but constructed ingeniously, on the shores of lakes, habitations upon piles. But the lake-dwelling man was our immediate predecessor. He was already in possession of our principal domestic animals and our most important cereals; he knew even how to make a kind of coarse bread, and perhaps fermented drinks as well. In addition to this, he wove stuffs, hollowed out boats, etc. To completely resemble our earliest historical ancestors the use of metals alone was wanting, but it was not long before he either invented or adopted the use of them. By a natural and necessary consequence, this human type, better endowed than his predecessors, multiplied and formed denser, more agglomerated and consequently differentiated populations, with chieftains and probably the rudiments of social organization."

The Historical Period joins on to the Neolithic Age. "That civilized races had for their ancestors these rude savages of the neolithic age cannot be a subject for doubt. At the end of the neolithic period, prehistorical archæology joins on with historical archæology: bronze is associated with shaped flints: then the Gallo-Roman unites in an unquestionable manner authentic historical times to the latest period of prehistory....."

A number of statements and evidences confirming palæolithic and neolithic data are also scattered throughout the writings of the Greeks and Latins. The poet Lucretius gives proof of this in his treatise: *De Naturâ Rerum.*

Hercules with his wooden club and his dress made from the skins of beasts seems as though he were the mythical personification of these ancient traditions.

Pliny attributes the invention of houses to two Athenians. Diodorus also describes to us the first men as being miserable savages, naked, without fire or shelter, and seeking a refuge from the winter in caves. He mentions the Ichthyophagi, dwelling in caves perfectly naked, living on shell-fish, fish, seals, and other marine animals which they killed with sharp stones.

He describes the Troglodytes, who strangled their old and infirm men; the Lybians, who observed neither good faith nor justice with strangers, and the Celts with their savage customs, among others that of killing strangers.

Plato, Titus Livius, and Herodotus support the preceding statements and, moreover, we find in Herodotus a complete description of one of those Lake-villages, the discovery of which in Switzerland has so excited the archæological world.

"To sum up, it remains an established fact, on the one hand, that a race of men of the quaternary, and perhaps of the tertiary period occupied Europe in pre-historical times, and, on the other hand, that from this primitive but *gradually progressing* race of men sprang the nations of classical antiquity and the more or less barbarous peoples which surrounded them."

Analogy between the Industry and Habits of Prehistoric Times and those of Contemporary Savages. A considerable analogy exists between the industry and manner of life of prehistorical savages on the one hand and of contemporary savages on the other. These similarities, which are often very striking, have been noticed by Lubbock in England and by Hamy in France, and had already been pointed out by Jussien, the naturalist, in 1723. The resemblances are in fact numerous and curious, and their number increases in proportion to the advance of prehistorical archæology.

Letourneau enumerates a certain number of them, such as lance-heads made of obsidian stone axes, arrows, etc. of contemporary savages identical with those of their prehistoric ancestors. It is the same with the cups for grinding up colours, with the chiefs' staffs of command, with the mode of obtaining fire by striking a flint against a lump of ferruginous pyrites, with engravings and drawings upon the bones of large animals, with the manufacture of pieces of rude pottery, and, among savages who are unacquainted with the art of making burnt pottery, with the habit of boiling water by throuwing into it red-hot stones, etc.

"The Tasmanian and Australian aborigines are or were still in the broken-stone age, and a number of American tribes have not passed the shaped-stone age. The New Caledonians and Polynesians had reached the polished-stone period. The latter, however, were still ignorant of pottery, while the Papuans and Guaranis are ceramists and, like our ancestors of the polished-stone period, entrust their women with the task of moulding the clay by hand, without a potter's wheel.

"The progress of the wild races is slow: thus, though the sea is the principal source of the food supply for the populations of Melanesia, many of them have not as yet discovered the use of the hook, which does not appear to have been thought of in Europe until the end of the polished-stone period."

Anatomical Analogy between Prehistorical Races and Savage Races of the Present Time.

"It is not only in his habits that the savage of the present day resembles prehistoric man. Like him he possesses the greater part of the inferior anatomical characteristics. The most frequent of these characteristics are,—tibias shaped like the blade of a sabre, persistence of the Olecranian Fozamen, Pragnathism, diminished size of the cranium, thickness of its walls, existence of superciliary swellings, simplicity of intracranial cerebral impressions, wisdom teeth with five roots, like that of the jaw-bone of the Naulette, etc. The cranian evidence should not be appealed to without reserve. There are, in fact, savages with short heads and savages with elongated heads. It is however impossible to help remarking that dolichocephaly is a characteristic both of our quaternary ancestors and of the majority of the very belated races of our own times.

From all these analogies, which sometimes go as far as identity, Letourneau draws this conclusion: "Inferior, contemporary races, generally speaking, are a reproduction of primitive humanity; prehistorical times live again under our own eyes, and the antiquity of the past is resuscitated in the antiquity of the present. Some human types, better endowed than the rest, have evoluted and gained more and more ground in the struggle for existence. These favoured races have thriven; their representatives have multiplied; they have created complex civilizations and formed a kind of abyss between themselves and the races which have remained stationary, or at least have only evoluted with the millenary slowness of the earliest ages. Man, gradually growing civilized, has come to despise and too often to exterminate the retarded human races, but no less are the latter living portraits of his ancestors. (*La Préhistoire Contemporaine.*)

"When this general view is once admitted, an immense field is opened out to anthropological investigation; the development of the human race can henceforth be followed step by step, as we follow the evolution of an embryo. It is impossible then to see in man a miraculous being, instantaneously created by a divine caprice; the distance between the superior mammifers and the chief among them diminishes in a singular way."

Letourneau then shows that with the aid of ethnography we can go back to the origin of the human race; all the intermediate links are reconstituted from the beginning to the end. We then see the steam-engine connected with the broken flint, the steamboat with the primitive raft, the palace with the cave, flexible languages with monosyllabic languages, differential calculus with the primitive numeration of the Australian trying unsuccessfully to count his fingers, and the great Aryan religions with the animism of the African negroes which generously endows the external world with a conscious life analogous to their own. Raphael there becomes the distant descendant of the primitive artists of Lozère.

For the study of social evolution and of the phases of civilization, the comparison between the past and the present has constituted a peculiarly successful method. Dead prehistorical times and living prehistorical times have thrown light one upon the other.

It throws a Light upon Past Prehistorical Times and upon the Social Evolution of the Human Race. But if methodical ethnography can afford assistance to prehistory, it is in another way precious for the study of the social evolution ot the human race. All the long series of past generations comes forth, so to say, from the tomb and we can in some sort compose the embryology of our social institutions. "For instance, we can study *de visu* the formation of society; it is in the first place the primitive, anarchical horde of the earliest times of the quaternary period, such as still exists in Terra del Fuego. Then we see these hordes joining together in clans and tribes; these form within themselves classes and castes, obeying chiefs, and finally constituting despotic monarchies, etc.

"At the same time, the family, in the first place matriarchal and then patriarchal, emerges from the primitive promiscuity. Woman, in the first place a beast of burthen, a reserve food-supply, a mere machine of pleasure, the female of prehistorical times becomes almost a person in proportion as marriage is established, passing through the stages of polygamy, polyandry and other various modes of conjugal association."

Letourneau thus terminates his most interesting chapter on Prehistory.

"I shall end with a general observation. From whatever side we interrogate the history of civilizations, the idea of evolution always proceeds from it, and all the anthropological sciences—Prehistory, Comparative Anatomy of Human Races, Embryology—speak in the same strain. A progress, slow undoubtedly but constant, is the law of the human race. Certainly it is far from being the case that an ethnical group, separately considered, always necessarily progresses. Partially, evolution may be and often is retrogressive. The remains of races and peoples conquered in the struggle for existence strew the ground of historical and even of prehistorical times; but, taken altogether, the human race has for its motto, 'Forwards! to stand still is to decline'."

The Psychology of Evolution. The origin of our mental evolution is very distant, since the roots of the human race descend into the night of geological ages; but quaternary man is already an artisan of progress and refutes by his style the pessimism of modern times. Let as hear what Chinese thinkers say upon this subject. "When the child is born, he is a man, and yet we see in him only a child. When he grows up, it is not only his arms and legs which develop, but his ideas. It is the same with the human race. No man will ever see it in its entirety, and yet it exists. It is one being in a multitude of members. All ideas are in it, and outside it there are none; but it displays them only in proportion to its growth." (G. Simon. *La Cité Chinoise.*)

CHAPTER IX.

THE ORIGIN OF MORAL INCLINATIONS.

I. *The Impregnation of the Nervous Cellule.—Luminous and Nervous Phosphorescence.—Memory of Nervous Cells.—Motive Associations Registered.—Diderot and Free Will.*

II. *Instincts in Animals.—Functions and Instincts.—Organic Predestination.—Acquired Instincts.—Obliterated Instincts.—Training of Dogs.—Moral Conflicts in the Dog.—Man-eating Bloodhounds.—Deadened ferocious Instincts.—Heredity of acquired Instincts.—General Formulae.*

The Impregnation of the Nervous Cellule. The reader will observe that Letourneau absolutely rejects the ancient works of philosophy, "which are in process of passing into the fossile state. With the aid of the progress of natural science, psychology becomes more and more a district of biology. The fact is that in men and animals all that is conscient: the knowledge, the impressions, the sensations, the desires, the passions, the understanding, all depends upon the cerebral nervous cells and is the result of their working. It is therefore logically impossible to treat upon morality without connecting it with biology and, above all, with the fundamental properties of the nervous cellules.

"Now, the most primordial property of the nervous cellule is its aptitude *to be impregnated*, that is to retain the trace of functional acts performed in its midst."

Letourneau compares it with certain substances which store up the light after being exposed to the sun. And he gives the instance of the print of Niepce de Saint Victor, kept for some days in the dark after having been first exposed to the direct rays of the sun. This print afterwards laid in the dark upon a very sensitive photographic paper, gives, after twenty-four hours contact, a reproduction in black of the *white portions of the print.*

This amounts to saying that, in this case, the solar light, a mode of movement as we are now aware, has impressed upon the molecules of the bodies illumined by it a certain persistent vibration which may become phosphorescent or photographic action.

"Now it is upon a primordial phenomenon of the same kind that the working of the nervous cellule rests. Chemically very unstable, in the sense that under the influence of appropriate excitations it reacts with extreme rapidity, the nervous cellule possesses nevertheless a great functional tenacity. It has a memory, sometimes conscient, sometimes inconscient; that is to say, a tendency to preserve in its molecular arrangement the trace of the physiological vibrations of which it has been the seat. As bodies susceptible of phosphorescence *remember* the light, so the nervous cellule remembers its umost acts, but in ways infinitely more tenacious and varied.

"Every act over which the nervous cellule has presided leaves in it a kind of functional residue which, in future, will facilitate and sometimes induce its repetition. In fact, this reiteration will become more and more easy and will at length be affected spontaneously and automatically. The nervous cellule will then have acquired an inclination, a habit, an instinct, a want. At this moment, in an organism as complex as that of man and the superior animals, a whole series of reflex acts, dependant upon the nervous cellules, are produced, unfolded, and succeed one another automatically in obedience to the nervous elements which govern them.

All this is performed sometimes consciously, sometimes unconsciously. In fact, .the consciousness is not in any way necessary to this performance, existing as it does only in those animals which stand very high in the series and solely for certain superior functions. Besides that, it very easily disappears, and we are all aware what complex acts we are able to perform, without having any knowledge of them, when we are in a state of abstraction.

But this state of unconsciousness is the normal state of a number of inferior invertebrates. In them, numerous associations of movements, often of a very complex nature, are incarnated in the nervous ganglions and are performed with a mechanical precision the more perfect as they are undisturbed by any inhibition or conscious excitations.

Phenomena, fundamentally identical, are moreover to be observed in the superior vertebrates, not excepting man, especially in what concerns the nutritive life. All the innervation of the grand sympathetic is inconscient in the most intelligent philosopher as well as in the most degraded native of Terra del Fuego.

"To understand what is about to follow, it is sufficient to have pointed out the fundamental property of the nervous cellule, *the property of impregnation.* Every nervous cellule must be regarded as an extremely delicate registering apparatus. Every state of consciousness which is once produced with sufficient intensity, leaves in the brain or in the mind a functional disposition tending to reproduce it afterwards. No mental act is effaced absolutely: each of them leaves an impression which will facilitate its reproduction. Each sensorial impression, each current of molecular activity to another, each cerebral reaction which flows to the motive nerves, leaves behind it a modification of the nervous elements which have acted, a kind of remembrance, and its reproduction becomes more easy in proportion as it is renewed." (¹) More-

(¹) Maudsley, *Physiologie de l'Esprit.*

over, and this is a fact of incontestable observation, when certain nervous impressions are sufficiently fixed, incarnated and organized in the nervous centres, they become *hereditary*. Specially with what concerns morality, it may be said that every individual *raises or lowers the moral tone* of his posterity, as his own moral tone has been raised or lowered by his ancestors. Thence comes the Indian proverb: "A man takes the evil nature of his father or of his mother, or of both; his origin can never be hidden."

"But the transmission of these inclinations is not effected otherwise than by numerous associations of movements, which may serve to make it better understood. We are aware that, in the new-born infant, the grey cortical substance, still imperfectly organized, is not even bound with fibres at the inferior cerebral ganglions or at the spinal marrow. The new-born child is therefore, according to all probability, incapable of sensation and of conscious impressions, but he performs very well a quantity of reflex, coordinate acts, adapted to an end; he does not yet see, but *he already knows how to suck.*

"But intercellular, motive associations are the most simple, the most common and the most schematic of all. To be more elevated and more habitually conscient, the associations of sensations and sentiments are not more or less mysterious and all can combine together. The psychical consciousness, in this connection, differs very little from unconsciousness. Thus, during certain conditions of sonnambulism, a man appears perfectly able to perform a series of very complicated acts without having any consciousness of them. It is even enough, in order to act as an automaton, to be greatly preoccupied or abstracted. A man can then walk, perform manual labour, even read and decipher music, etc., without thinking any more about it than if he had no cerebral hemispheres. Every one of us has been a witness or an actor in scenes of this kind."

Regarding this, Letourneau quotes the well-known episode of Diderot's geometrician who, absorbed in the solution of a problem, acted as an unconscious automaton for a whole day, and when evening came was unable to give any account of his actions.

"Let us briefly sum up what it is important for us to remember in all the preceding.

"The nervous cellules are, above all, apparatus of impregnation. Each current of molecular activity which traverses them, leaves a more or less reviving trace. Through a sufficient rèiteration of the acts, these traces are organized, fixed and even transmitted hereditarily, and to each of them corresponds a tendency or inclination which will occasionally be manifested and will contribute to the formation of what is called the *character*.

"This general view must be completely present to the mind, if we wish to understand the origin and evolution of morality. But, before going further, we must study in animals some of these mental movements, examine their origin, and see how they may be modified and how they may be created."

The Instincts in Animals. We have seen that in superior animals and in the chief among them, man himself, there exists a quantity of coordinations of movements so deeply inscribed in the nervous centres, that they are at the same time unconscious and indispensable to the working of the life: these are not *instincts* but *functions*. When the series of acts registered in the nervous centres relates to the animal's manner of existence and suggests, whether it is conscious of it or not, a certain conduct in life, the result is what is called *instincts*. But, at bottom, the biological reason of the functions and of the instincts is the same. The acts of certain insects in preparing food, which is not the same as their own, for their larvæ, which they will never see, any more than they have known their own parents, are absolutely comparable with numerous organic acts, from which result in the superior animals digestion, circulation and respiration.

The nervous centres of superior animals must be pictured in the mind as fields that have been sown.

In the midst of the nervous cellules of each human being for instance, there exists a whole mental preformation, an arrangement, a *special* molecular rhythm, resulting from innumerable experiments made by the ancestors, a whole inherited education, which, on contact with the outside world, suggests such and such a course of conduct to the individual.

This organic predestination exists in all animals of complex structure, in man as well as in insects. It is very striking in metamorphosing insects, which, in proportion to their transformations, adopt different modes of life in strict correlation with each of the forms which they assume. Thus Réaumur and Swammerdam are agreed in stating that, as soon as its wings are set free, a young bee is capable of collecting honey and constructing a cell. No previous education is necessary.

The well-known observations of Spalding (¹) have brought to light this automatism of certain innate tendencies among birds. Thus swallows placed in a cage, as soon as they were hatched until their wings were developed, flew as soon as they were set at liberty. Letourneau then quotes other instances of which we shall give a rapid summary, such as skill in picking up food as soon as hatched; chickens scratching, though kept apart, as soon as sand is laid under their feet (²); the migratory instincts of certain animals. At a given moment the migratory bird flies against the bars of the cage which shuts it in; the salmon leaps out of the pond where it is a captive (³). The hour of departure has struck; it must be gone.

"The instinctive fear inspired in many of our domestic animals by wild animals which they have never seen before, but with which their ancestors have had many a tussle, also clearly shows with what tenacity and fidelity certain mental impressions are hereditarily transmitted."

(¹) *Macmillan's Magasine*, (Poirin, 1878), quoted by Romanes in *L'Evolution Mentale des Animaux.*

(²) Romanes—*L'Evolution Mentale des Animaux.*

(³) *Lettres sur les Animaux.*

The instances quoted by Letourneau are those of the chained-up bear and horses, of a young turkey brought up alone after it was hatched, hearing the cry of a kite in a cage; of kittens, separated from their mother after birth, growling and bristling their hair on seeing a mouse for the first time.

"The existence of these innate tendencies can only be explained in one way, by a slow work of ancestral education having created in the midst of certain nervous cellules what Maudsley calls "psychical residues," that is to say special molecular arrangements, necessitating a special conduct in collisions with the outer world.

But if this mode of interpretation is exact, the instincts of animals ought to vary with the manner of ancestral education: it comes in fact to this: "it is certain, says Leray (¹), that before being able to learn by personal experience, young foxes, when coming out of their earth for the first time are more suspicious and wary in places where they are much harried, than the old ones are in places where no traps are laid for them."

So Darwin relates that in the desert islands of the Galapagos, the animals had no fear of man, and the birds freely perched upon the guns, etc.

"The education imposed by man upon a sufficient number of generations ought to produce, and in fact does produce, the same phenomena."

We have an instance of this in our domesticated ducks which have lost the habit of flight, and in Indian ducks which do not enter the water unless forced to do so.

"This hereditary memory, called instincts, fades and finally vanishes away, when not maintained by exercise. And this is very natural, since it is born of the sustained repetition of the same acts. But, for the genesis of morality, these facts are singularly important. I shall quote some more of them; the foundation cannot be too solid."

According to Romanes, the custom adopted in Ger-

(¹) *Lettres sur les Animaux.*

many of taking away the calves after their birth, has produced after hundreds of generations a notable weakening of maternal love in the cows. And yet in the superior vertebrates, as it is in man, this is the strongest of instincts.

Again, in the same way, if we take the trouble to domesticate the wild rabbit, after several generations they no longer have any inclination to dig burrows. A very small number of generations is sometimes sufficient to effect these metamorphoses.

Thus Romanes relates that a hen which had been made to sit three times following on ducks' eggs, conscientiously pushed into a stream some real chickens which she had at length been allowed to rear; so greatly had her instincts been unsettled.

Artificial education and the intervention of man is sufficient therefore to disturb the most firmly fixed instincts in certain animals: and further, the result may be the birth of new tendencies, as is proved by many observed facts. A tame panther which had never had living animals given to it to devour and had always been well treated, politely withdrew its terrible claws when it presented its paw: it made it a velvet paw, like a cat (1).

Dr. Jacobus has seen a wild boar, taken when it was quite young and brought up in an Annamite hut, come of an evening, like a domesticated pig, and lie down under the wattle bed of the owner of the hut. Besides, is not the pig the direct descendant of the wild boar, a fierce and courageous animal which defends itself against the larger wild animals when it can take its stand against a tree, and which even charges the elephant in the Indian forests. And the domesticated pig itself is susceptible of attachment and gratitude if the trouble be taken to bring it up from infancy.

Letourneau gives a large member of instances besides these, among which we shall be content with quoting the following.

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(1) Franklin. *Vie des Animaux.*

"The bark of our domesticated dogs seems certainly to be a kind of language, resulting from long and close cohabitation and intimate friendship with man. Wild dogs, as a matter of fact, do not bark: the dogs of the Red Skins which are imperfectly domesticated, do not know how to bark but are able to acquire the art, as one did which was born in London. The 'mouth' of our horses is also the result of domestication. A. Knight complained that he was unable to impart it to the Norwegian horses, which were very docile, but accustomed to be guided by the voice.

"Bishop Heber knew a gentleman in India, Mr. Troill, who was followed about in the streets by a spotted hyena which behaved just like a dog.

"Our grown-up domesticated dogs live quietly and decorously in our farmyards and never dream of committing any misdeeds, but the wild dogs of Terra del Fuego, Patagonia and Australia invariably attack poultry, sheep, pigs, etc.

"They are still in a semi-savage state, far removed from the gentleness of our civilized dog, which has become not only the friend, but also the worshipper of man, often justifying the saying of an old author quoted by Darwin: 'The dog is the only animal upon earth which loves us more than it does itself.'

"Moreover, and this is of greater importance to the study which we have in hand; man is not only able to endow the dog with new feelings and habits which were foreign to it, but he has also succeeded in creating in him veritable artificial instincts and special inclinations, which can be useful only to its master and yet are transmissible by heredity, just like natural instincts.

"The fact is that there is no essential difference between one and the other. All are the result of habit, the one of the persistent action of the external medium, the other of the education imposed by man.

"The study of these unquestionably acquired instincts is especially easy in dogs.

"The dog is in fact the most ancient companion of man. Except in New Caledonia and in some of the small groups of islands in Melanesia, 'the friend of man' is met with everywhere where the human race is represented, however humbly it may be so. The chief of domestic animals, the dog, has also been the only one whose existence has been in some way blended with that of man. But this cohabitation which has lasted for thousands of years, has deeply modified the moral nature of the dog, and has resulted in the disappearance of certain instincts and in the formation of others, even in the appearance of certain special tendencies which have become innate and peculiar to certain breeds of dogs.

"I will quote some of these peculiarities.

"For America, the descendants of certain dogs which for a long period have been trained for the dangerous pursuit of the pecari, know by instinct the tactics to follow: others get torn to pieces. Young pointers which are out for the first time, point at random, at sheep, at white stones, at a nest, etc., an organized, incarnated inclination exists in their nervous centres urging them to stop and point, but this inclination is absolutely instinctive, blind and without any special direction: in this there is surely an evident analogy with the moral inclinations, existing in a latent condition in the brain of every civilized man and which have suggested to metaphysicians their theory of innate ideas. We shall have to return to this analogy. For the present we must continue to study the pointing of the dog, and the means employed to train pointers.

"Let us hear what a specialist says on the subject: 'Pointing, especially in well-bred dogs, is a mechanical action, an instinctive power, which fastens to the spot the dog as soon as it perceives the game.' Now this fact of pointing and of pointing in silence is extremely curious. It is a complete reversal of the normal habits of the dog which, if not trained to it, always gives tongue when he comes across any game.

"A completely analogous moral transformationt akes place in sheep-dogs. It is the result of similar processes maintained for a sufficiently long period. The sacred formulæ alone vary. These usually are: 'Bark, keep alongside, stop'. When once incarnated, the tendencies inculcated in the sheep-dog by training also become hereditary, whatever the breed may be, for all dogs may become sheep-dogs. There is no longer any need then, in order to accustom them to seize the sheep by the ear, to attach a piece of bread to it. So without any previous training, they begin to run quite naturally not upon, but round a flock of sheep, without in any way harrying the animals which they watch.

"I have laid stress upon the process and effect of the training of pointers. For a study of the evolution of human morality, scientifically made and without any prejudice, these facts are of the highest importance. They throw a light upon the whole question.

"Many other artificial and yet hereditary inclinations exist, as is well known, in the dog. I will quote a few more of them. Ancient theories, be they right or no, having obtained general assent, can be sustained without proofs. It is quite different with revolutionary theories such as ours.

"'A young terrier, says A. Knight, whose ancestors had been used to destroy polecats, got into a violent rage on seeing a polecat for the first time. A spaniel regarded this proceeding with indifference, but followed a woodcock with a keenness which the terrier in his turn could not understand'." *Tot canes, tot sensus.*

"In the same way, hounds trained to hunt the fox abandon themselves to it with an ardour which seems to astonish dogs which are strangers to this sport.

"Franklin relates a curious story of two dogs, a Newfoundland and a mastiff, that fell together into the sea, just at the moment when they were indulging in a furious combat on the jetty at Donaghadee.

"The adventure would have turned out badly for the mastiff, who was but a moderate swimmer, if his adversary, recalled to his life-saving instincts by contact with the water, had not drawn his adversary to the shore.

"But this most singular fact deserves a little psychological analysis. Under a very simple and consequently clear form, it represents to us one of those moral conflicts which are so frequent in the human conscience. In the foreground of the psychological scene appears in the first place the combative instinct of the Newfoundland. This instinct is common to him and nearly all the individuals of the canine species, and is the result of the anterior life of his ancestors, before and after their domestication. To this primordial instinct may be perhaps added an hereditary antipathy for the race of mastiffs. Yielding to these moral forces, the Newfoundland throws himself upon his adversary, but at the height of the battle, at the moment when the inveterate instincts of which we have just spoken, are giving themselves free course, an incident occurs. Morally, it is insignificant, but nevertheless it changes the course of events. The impression caused by the cold awakens an artificial inclination, also incarnated in the animal's brain. It is the starting-point of another series of reflex acts. The life-saving instinct springs up, directs the animal's conduct, and the Newfoundland brings to shore the enemy whom but just now he was trying to strangle.

"The instance is typical and full of instruction, and, if we interrogate our own recollections, we shall assuredly find in them the trace of more than one moral change analogous to it.

"But nothing is simpler and clearer than the origin of these artificial instincts in the dog, and, laying aside all prejudice, we are compelled to recognize the fact that the origin of these inclinations throws a clear light upon that of human morality. Let us hear what G. Leroy, an exact and sagacious thinker, says:

"'The pain of a whipping, recalled to mind by a dog when lying down, balances against the pleasure of coursing a hare which is getting away.... This idea becomes so predominant that at length the sight of a hare causes him to drop his tail and return promptly to his master.' Surely these are moral conflicts as much as canine. But we will not anticipate.

"We have seen that the two great principles of training consist in punishing or rewarding in a suitable manner. There are however, other means practised, suitable for facilitating the training, for destroying certain inclinations and for developing others, in short for creating absolutely artificial inclinations. If we have to do with an animal of ferocious instincts, it is a most useful precaution to satisfy its appetite previously in a liberal manner. *Malesuada fames.*

"Birds of prey, though cruel and deficient in intelligence, their fierce nature may be subdued by never allowing them to suffer from hunger. A successful attempt, for instance, was made to get a hawk to live peaceably with pigeons. If we may credit Mantegazza, even the stupid crocodile is improved by satiety. Thus in the lagoon of Guadalupa, which is very large and full of fish, the crocodiles, always gorged with food, have become somnolent, inoffensive monsters, incapable of harming man.

"If, on the other hand, it is desired to excite the savage instincts of animals, in order to turn them to account, want is by far the most easy method. The only thing which is then hard to obtain is obedience.

"It is well known how the chief falconers of former times trained their pupils by means of suitable lures and good treatment. In this case also there were birds bred for the purpose. Thus certain hawks went so far as to bring back the game they caught in their flight.

"In the Antilles, the blood-hounds trained by the colonists to hunt the escaped, or Indian slaves recovered all the native ferocity of primitive dogs. They were brought up on a system evidently copied from that of falcon-trainers.

"Those ferocious instincts which it is so easy to revive, may also be deadened, and one of the surest means of this is to create bonds of sympathy by custom and long-continued kindness. The sanguinary inclinations of certain animals are mitigated and even quenched by making them live together with their prey or with their hereditary enemies; a more successful method is to have them brought up by the latter.

"Some ferrets which had been fostered by a hen, not only did not attack their adoptive mother, but when brought into the presence of another hen, to which they were bound by no debt of gratitude, they hesitated very much to attack it, paralyzed as they were by the conflict between their sanguinary instinct and acquired habit. With animals as with men, it often happens that they who know one another best hate one another least.

"In the Pampas of South America, Mantegazza tells us, it is by making sheep suckle puppies that they bring up sheep-dogs attached to the flocks. Nevertheless, as an extra measure of precaution, they are submitted to castration, so that no disturbing passion may distract them from their duty.

"These various artificial tendencies which man knows how to create in so many ways in the dog, may also be formed of their own accord by the mere fact of circumstances, and from this may result a sentiment hereditarily transmissible and consequently absolutely analogous to the inclinations, the origin of which is unknown, and which are named natural instinct.

"We have seen, for instance, a horror of butchers bequeathed hereditarily in a family of dogs, just like the instinctive terrors of which we have given instances. Regarding this, there is one circumstance to note. which is, among dogs at least, that the feelings of sympathy or antipathy, founded on the remembrance of some personal incident, easily have for their object a whole group of men who follow the same profession or wear the same uniform. The animal does not particularize: he loves or hates a whole category of individuals in a mass. We have spoken of a dog which hated butchers. Franklin tells us the story of a small spaniel called, 'Peeler,' which, having been saved by a policeman from the teeth of a Newfoundland, had a worship for all the policemen in London without distinction. For motives quite as personal as these, a number of our contemporaries love or hate such and such a people, such and such a class or social category.

A few years ago, in a town of Southern Italy, an individual stabbed an unfortunate soldier whom he did not know, in order to avenge an injury done to him by another soldier. When we come later on to treat upon the morality of the Australian aborigines, we shall have to quote facts of the same kind, very curious from the point of view of the evolution of morality. For the moment, we shall limit ourselves to verifying the fact, as we pass on, that identical feelings, absurd as they are powerful, may arise in the dog, in the Australian aborigine and in the so-called civilized European, and that for a most simple reason: the fundamental part of the conscious nervous centres, the aptitude of the cortical cellules of the cerebral hemispheres to perceive and retain analogous impressions. I have endeavoured to show how, by a suitable education, we can deaden or develop the instincts of animals, how we can endow these animals with new instincts which become hereditary, how these so-called artificial inclinations, but which are merely more recent than the so-called natural instincts, sometimes come into conflict with the latter. Before leaving this subject, I wish to return to it again by quoting some of those thoroughly demonstrative facts in which we see what may be called the primitive morality and the acquired morality contending in the animal's mind. In India it sometimes happens that the tame elephants escape and return to their wild state of existence; but they retain the impress of the education given by man, the instinct of obedience: 'more than one Indian has been seen to advance towards an apparently savage monster and order it to receive him on his neck. At the man's order, the animal recognizes at the very instant the rule of his former master.'

" In London, an elephant which had its day of celebrity on the stage of the Coburg Theatre and was called *Chunt*, after a long period of docility grew refractory and became subject to violent fits of temper. It was decided to shoot him. Now during the execution itself and while he was being fired at, he still obeyed the keeper: 'He fell nobly, says Franklin, like a General who is shot down.'

'The story of Mr. Romanes' dog, as related at a meeting of the Association for the avancement of Science, is still more instructive. It refers to a theft committed by the animal in the house.

'The animal had never stolen anything but once in his life: one day when he was very hungry he stole a cutlet off the table and carried it under the sopha. I had observed the act, but I pretended not to have seen anything and the guilty creature remained for several minutes underneath the sopha, divided between the desire of satisfying his hunger and the feeling of duty; the latter triumphed in the end and the dog came and laid the stolen cutlet at my feet. After doing this, he returned and hid himself under the sopha from which it was in vain that I called him to come out. In vain too did I gently stroke his head; the only effect of this caress was to cause him to turn away his head with a truly comical air of contrition. What gives a peculiar value to this instance is that the dog in question had never been beaten, so that it could not have been the fear of corporal punishment which caused him so to act. We are therefore compelled to see in these acts instances of a development of the faculty of conscience as high as can be given by the logic of sentiment without the aid of the logic of signs; that is to say a degree almost if not altogether as high as that which we find in the lower savages, in young children and in a great number of idiots and of deaf-mutes without education.

'This fact has the value of an experiment *in anima vili*. It refers to an animal, well bred, well brought up, with principles and a whole superior moral arsenal resulting from his intercourse with man; but behind his mental acquisitions of relatively later date, there is an old foundation of the ancestral inclinations of the breed. The temptation arises, the animal succumbs: that is the old morality. But immediately the new morality awakens, protests and stops the culprit, producing in him a feeling of shame and regret, of moral suffering to which it is difficult not to give the name of *remorse.*

" Before going any further, I will sum up in a few words the general data set forth in the preceding passages. They may be contained in two brief formulæ:

" 1. The nervous cellule is a registering apparatus, and its stored-up impressions can be transmitted hereditarily: thence comes the formation of innate tendencies, natural inclinations and instincts.

" 2. The intervention of man, the training, may disturb the most rooted instincts in the animal and even arouse new ones."

(*L'Evolution de la Morale.* Ch. Letourneau. Vigot Frères, Editeurs.)

The reader is requested to remark that starting from analogous facts but studied from another point of view, Letourneau arrives at conclusions diametrically opposed to those of Father de Bonniot and Dr. Fournier. For the latter, the instincts and the intelligence from which proceeds the reason, are of two different orders, and they completely divide the sensitive from the moral soul. For Letourneau, instinct is a function of the intelligence and therefore it is a rudiment of reason with the aid of the memory.

From that, to find that morality is not the appanage of man alone but that it exists in germ among animals, is but an easy step. This is what Letourneau does in his third Lecture on the Origin of Moral Inclinations (continued) which, on account of its great importance, we think ought to be given *in extenso.*

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CHAPTER X.

THE ORIGIN OF MORAL INCLINATIONS (*Continued*).

I. *The Moral Feelings in Animals.—The Human Kingdom.—Morality arises from the Social State.—Animal Psychology and Human Psychology.—Maternal Love in Animals and in Man.—Filial Love in an Elephant.—Altruism in Animals.—Great Qualities and Small Defects.—Despotism among Monkeys.—Sympathetic Feelings among Monkeys.—High Morality of Ants and Bees.—Diversity of the Moral Feelings in Ants.—Influence of Public Opinion among Ants.—Criminal Bees.*

II. *How is Human Morality formed?—Immoral hereditary Tendencies in Man.—Absence of Remorse in Certain Animals.—Genesis of the Conscience.—Unwritten Laws.—Relativity of the Moral Feelings.—The Non-Existence of the Soul according to Roux, Author of La Psychologie de l'Instinct Sexuel.—Conclusions by Dr. Jacobus.*

The Moral Feelings in Animals. The Human Kingdom. "Nothing but the title of this lecture will shock certain of my hearers. In fact, we have been taught for a long while that man is a being apart in the universe, a kind of ruined God, having retained his rights, the ruins of his ancient fortune, and among others that of being moralized and moralizable. It is even on the supposed existence of this privilege that, latterly again, an attempt has been made to found the strange theory of the human kingdom. To stop at the present day to refute this dream of a mad metaphysician would assuredly be a loss of time. The close physical, moral and intellectual relationship of man with animals no longer needs to be demonstrated. We shall see elsewhere when sketching out the ethnography of the moral feelings, how bestial is the morality of the inferior races. That man, taken in the mass, is at the present day the first, the least imperfect and the most perfectible of animals is an incontestable fact, but yet he is nothing but a rough-hewn primate, an upstart who cannot disown his genealogy: the latter is imprinted in his flesh, in each of his organs, in each of his anatomical elements, and even in that which is called his soul in his mental powers. It is so with the qualities and with the defects even of civilized man, the origin of which dates back very far, for instance: maternal love and the ferocious instincts which are so easy to arouse.

The Moral Feelings spring from the Social State. "Among animals, as among men, all social life presupposes and demands some regard for associates, and a certain degree of mutual feeling. And so there is nothing less uncommon, among animals, than instances of devotion for relatives, or for members of the group, and features of family or social altruism. As soon as two beings endowed, however rudely it may be, with sensibility and thought, live together and associate, even if it be only for a time, for any object, moral feelings and at least a certain degree of morality must spring up. It is necessary that each one of them should more or less subordinate his desires to those of his associates. The groups in which the members have regard for and aid one another the most, will be likely to have the better of their competitors in the struggle for existence.

"Now a number of animals already highly developed, group themselves in more or less numerous and complex families and hordes. In the latter case are bees and ants, which, as we shall shortly see, offer more than one moral example to the first of the mammifers, who declares that he was modelled upon a divine pattern. For, among animals, the degree of perfection of the social inclinations is far from coinciding rigorously with the hierarchical rank occupied by the species in the zoological classification. How far for instance, is the monkey in this connection inferior to the ant."

Animal Psychology and Human Psychology. "It is sufficiently well known that the love of parents for their young may be elevated, in a number of species, to the height of heroism. In this case it is not so much an analogy as an identity that exists between man and the superior vertebrates. I will give a few instances as specimens: 'We see birds, says G. Leroy, when their young are in danger of perishing from cold, covering them so unceasingly with their wings that they forget their own need of food and often die upon the nest.' (¹)

"Volumes might be written simply by recording facts of this kind which have been observed. I will select a few instances. The whole of this animal psychology is invaluable to us. In man, and especially in man in a state of development, the existence of the conscience is infinitely complex. It may be compared to a thick tree, under the luxuriant foliage of which the eye can scarce discern the main stem and the larger branches which bear all the rest. On the other hand, while the motives in animals are essentially the same, they are usually of extreme simplicity. On the one hand we have a complicated building, on the other the ground-plan which explains it.

Maternal Love in Man and Animals. "A dozen years ago the newspapers related with admiration the heroic feature of a young mother who, having been thrown into a river through a carriage accident, threw

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(¹) Leroy, *Lettres sur les Animaux*.

her child back on to the bank by a supreme effort before she was drowned.

"It was a noble act, but she-monkeys are wont to do the same.

"Spix saw a female Stentor Niger in Brazil which when shot, collected its remaining strength to throw its young one upon the neighbouring branches; when this maternal duty was accomplished, the mother fell from the tree and expired (1).

"In 1828, the American Captain Hall observed a similar incident on the coasts of Sumatra: 'The first shot, says the narrator, broke the great toe of the mother who gave vent to a terrible cry. Then, lifting up its young one as far as its great arms enabled it to reach, it deposited it on the highest branches which seemed too weak to bear its own weight. From this moment the poor mother seemed to forget its own danger and to think only of the fate of its young one. Glancing for a moment to the top of the tree, it urged the little one with its hand to escape as quickly as possible. It even seemed to mark out the way which it must follow in order to reach from one branch to another the darkest and the most inaccessible parts of the forest. The second shot brought the animal to the ground' (2).

"Facts of a similar kind have been observed in the case of mammifers which stand high in the series. Livingstone, in the account of his journey to the Zambesi, relates the touching death of a female elephant which covered its little one as it fell with its enormous body, caressing it with its trunk while the Kaffirs who escorted the traveller surrounded the animal and riddled it with their spears, complimenting it thus: 'Great Chief, you are about to die; the Morimos have said it.'

"J. Hayes, the Arctic traveller, also relates the dramatic end of a white she-bear which had been tracked by a pack of Esquimaux dogs and three white hunters armed with carabines. The animal, preoccupied by the sole thought of protecting a cub which was accompanying it, almost scorned to defend itself: 'Once again, says Hayes, it was able to shelter beneath its body the small but courageous creature which had lost all its strength and from which the blood was flowing freely.' Then the she-bear was wounded by five gun-shots—'Although exhausted by the loss of blood, the she-bear was not yet disabled; collecting her strength, she compelled her assailants once again to retreat precipitately and drew under her body her little one for whom she was giving her life.... Half strangled by Harsuk (an Esquimaux dog) and his companions, the cub expired at its mother's feet; when she saw it fall, forgetting her danger, her wounds, and the furious pack which was tearing at her flanks, she began to lick it with passionate tenderness. She refused to believe that it was dead and tried to raise it up; she caressed it in order to encourage it to fight again; then all at once she seemed to comprehend that it no longer had need of her protection and turned towards her tormentors with redoubled rage. For the first time she tried to escape.... A ball penetrated the spine and the she-bear in her turn rolled over on the snow which was stained with her blood (1).'

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(1) *Simiarum et Vespertiliorum species nova Monachii.*

(2) Franklin. *Vie des Animaux.*

"Alfred de Vigny in his poem on *La Mort du Loup*, expresses the same idea.

> "Hélas, ai-je pensé, malgré ce grand nom d'hommes,
> Que j'ai honte de nous, débiles que nous sommes!
> Comment ou doit quitter la vie et tous ses maux,
> C'est vous qui le savez, sublimes animaux!
>
> . . . .
>
> Ah, je t'ai bien compris, sauvage voyageur,
> Et ton dernier regard m'est allé jusqu'au cœur!
> Il disait: 'Si tu peux, fais que ton âme arrive,
> A force de rester studieuse et pensive,
> Jusqu'à ce haut degré de stoique fierté
> Où naissant dans les bois, j'ai tout d'abord monté
> Gémir, pleurer, prier est egalement lâche
> Fais énergiquement la longue et lourde tâché
> Dans la voie où le sort a voulu t'appeler,
> Puis après, comme moi, souffre et meurs sans parler.'"

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(1) *La Mer Libre*

"In a number of species of animals, these prodigies of heroism are ordinary among the females. Sometimes however, the male rivals his partner. Audubon relates that in case of danger threatening the nest, the male goose of Canada compels the female to flee and remains to face the enemy alone. (¹)

"The family-feeling is very powerful in many kinds of animals, but among them, as in the human race, the very power of love restrains the altruistic feelings. Nothing is more natural than this moral antagonism. The partridge, G. Leroy says, is very careful and very active for the interests of its own young, but pursues and kills unpityingly all those which do not belong to it, when it comes across them. (²) Other birds, on the other hand, have wider affections. The hen-pheasant, says G. Leroy again, has less attention for its young and abandons those that wander away or leave it, but it is sufficient to follow it in order to have a right to its care, and it becomes the common mother of all those which need it. (³)

"I have hitherto spoken more especially of the love of parents, particularly of the female for her young. This is in fact the great moral force in the majority of animals. But all the primordial sentiments of what is called the human soul are to be met with in animals.

Filial Love in the Elephant. "Thus, while it is far rarer than maternal love, filial love nevertheless exists among certain animals. In the account of his travels in Africa in 1836—1837, W. Harris relates that a young elephant, after passing a night near its mother's body, came the next day to the hunter whom he encircled with his little trunk in order to ask for assistance. (⁴)

"Usually in herds of animals, the weakly and the wounded are driven away, as it also happens in primitive

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(¹) Audubon. *Scènes de la Nature dans les Etats-Unis.*

(²) Leroy. *Lettres sur les Animaux.*

(³) *Ibid.*

(⁴) Schopenhauer. *Fondement de la Morale.*

human societies: nowhere is it any good to be weak. Sometimes the mothers are even capable of infanticide. Thus it happens that our domestic rabbits sometimes devour their young, and the striated monkeys sometimes crush their young against a tree or eat their head.

"The herds of authropomorphic apes are generally under the rule of an old male, but the latter only retains his power while he has the strength to impose it. One fine day the young ones rebel and murder their master.

Altruism of Animals. "When rabbits are feeding together outside their burrows, the old ones sound the alarm if necessary by striking the earth with their hind legs. If some of the younger and more imprudent rabbits do not attend to these first warnings, the old ones keep on striking and expose themselves for the public safety. During a hunt in India, two elephants fell into a ditch. One of them succeeded in getting out, and afterwards, instead of going away, he stretched out his trunk to assist his less agile companion. This occurred in the presence of numerous witnesses (1).

"In Abyssinia, Brehm was an eye-witness of the following fact: A troop of baboons, being attacked by dogs, scampered off while the old ones protected their retreat: but a young baboon about six months old was not able to follow the band, and, perched on a branch, loudly cried for help. One of the largest males, touched by his lamentations came down again from a hill up which he had climbed, went towards the one left behind, reassured him and brought him back in triumph, keeping the dogs in awe.

"That excellent observer of the habits of birds, Audubon, relates how a nest of red American thrushes, being attacked by a serpent, which the male thrush was resisting as well as he could, another male of the same species, in answer to his companion's cries of distress, flew down in all haste to the help of the two unfortunates. A third one was fighting with the serpent. Instances of old or infirm birds fed by their friends or relations are not uncommon. On the shores of the Salt Lake of Utah, an old and blind pelican was fed, says Captain Stansbury, by his companions. Indian crows, says Mr. Blyth, give food to two or three of their blind companions. Darwin, who quotes these facts, was acquainted with a similar feature observed in a domestic cock (1). I myself have seen canaries putting food into the beak of another canary which was old and impotent and their far-off ancestor.

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(1) Franklin. *Vie des Animaux.*

Great Qualities and Small Defects. "Acts of this kind, in truth, (and it would be easy to quote many others), are not moral acts properly so called, in this sense that they are capricious, dictated by individual feelings, and that they often precede or succeed acts which are unreservedly selfish. The same monkey which is capable of dying in order to insure the safety of her offspring, shews itself incapable of enduring any restrictions from gluttony. It will be seen, for instance, thrusting its hand into its little one's throat to draw out of it an almond or some other delicacy which it will then devour with revolting selfishness (2). But it is the same with the human race; *homo sapiens*, the wise man, is far from being always strung to the pitch of heroism, and when great motives are silent, the small ones have their turn.

Despotism among Monkeys. "Many other moral acts of an altogether human nature may be observed among monkeys. In our menageries, among monkeys of various kinds, shut up in the same cage, lower feelings which are but too common in the human species are seen to develop, such as arrogance and overbearing conduct on the part of the strong, and servility on that of the weak. A certain social hierarchy, founded solely upon the right of the stronger, is established in the little society. The lowest class of the inferior quadrumana, the lemurs and striated monkeys, form an oppressed class, the members of which band themselves together to oppose as far as they are able the domination and encroachments of the previliged classes. The humble, submissive and resigned attitude of these helots does not always save them from blows and injuries (¹). But, as we shall see, this picture resembles in every feature that of the lower human societies.

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(1) Darwin. *Descent of Man.*
(2) Franklin. *Vie des Animaux.*

Feelings among Monkeys. "In another way the following picture is more human still. I borrow it from the same excellent observer. 'I assisted, not without a lively interest, at the *accouchement* of a dog-faced monkey. Scarcely was the little one born when it was introduced into the apartment of other females of the same species of monkey. It was a touching scene. The females took hold of the little thing one after the other, kissed it, passed it round, covering it with caresses, and came gently near to the mother as though to congratulate her upon her happy delivery. I wished that there had been some women there; for nothing could have been more moral or more edifying than this homage paid by animals to maternity, infancy and the sacred feelings of the family.' (²)

High Moral Feeling of Ants and Bees. "I have previously remarked, that from the point of view of moral development among aminals, we must often deviate from the zoological hierarchy. The insects of highest development, bees and ants, which may be called the primates of the Invertebrates, are morally far superior to the mammifers and even to the inferior human races. Among these interesting species, which have succeeded in creating large communities in which the family does not exist, the feelings of duty, self-abnegation and care for the public interest are developed

(¹) Franklin. *Vie des Animaux.*
(²) Franklin. *Vie des Animaux.*

to the point of heroism and, apparently among all the citizens of the republic. The worker-bees defend with admirable zeal and disinterestedness the young of the common mother. They open the shell of the newly born and watch over it until it is in a state to fly and devote itself to the functions to which it is called (¹). Lubbock has also remarked the care which the old ants lavish upon the young when the latter come forth from the chrysalis. An ant whose antennæ Latreille had cut off, literally had its wounds dressed by its companions, who poured upon them drops of a transparent liquid secreted from their mouth for this purpose. Lubbock has seen a crippled ant carefully tended for the space of five mouths. (²)

"According to Huber, the moral development varies in different ants'nests. He mentions a tribe remarkable for the social harmony which existed among them. 'The insects of which it was composed, continually offered food, caressed with their antennæ and carried one another about from one place to another.' (³) When it is a case of defending the republic, bees and ants attain the extreme limits of heroism. 'It is possible to divide an ant in two through the middle of the body without depriving it of its desire to defend its home. The head and upper part of the body still walk and carry off the nymphae to their shelter.' (⁴)

Influence of Public Opinion among Ants. "Highly developed as social morality may be among these insects, there are, however, individual differences. Thus when an ants'nest is conquered and pillaged by an army of enemies, some of the ants are to be seen throwing themselves into the midst of the invaders to save some more of the larvæ, even at the peril of their life, while the mass of the tribe beats a retreat. Ants also seem, like man, to be very careful about public opinion.

(¹) Huber. *Fourmis Indigènes.*
(²) *Scientific Review.* Nov. 1885.
(³) Huber. *Fourmis Indigènes.*
(⁴) *Ibid.*

'The same worker, says Forel, who will let herself be killed ten times over when she is surrounded by her companions, will show herself extremely timid, avoiding the slightest danger, even an ant much weaker than herself, when she is alone and twenty yards away from her nest.' The same individual fluctuations of morality are also observed among bees. In this there is surely something very analogous to what passes in the human brain.

Criminal Bees. "In general, the domestic bee is as sober as it is laborious; the workers never touch the winter supplies in the closed cells; moreover, even in the cells which are open for present requirements of food, each bee can only remove exactly the ration required for its wants. But there are immoral and dishonest bees who introduce themselves by stealth into the hives to satisfy their gluttonous tastes. Lastly, when they are away from the community, when for instance they are pillaging a confectioner's shop, the majority of bees give way to gross intemperance. It is possible too, if we wish it, to render a bee depraved by feeding it on a mixture of honey and brandy. It then abandons itself very quickly to drunkenness and at the same time becomes lazy and dishonest. But this is exactly the same way in which drunkenness degrades a man.

"If my object were to compose a complete history of animal morality, I ought to accumulate traits of this kind, and nothing would be easier than to do so. But my concern is with man and the evolution of his moral feelings. The typical instances which I have just quoted are amply sufficient to establish the fact that elevated sentiments—the inclination to sacrifice ourself for one's family, one's fellows, one's fellow-citizens—are not the appanage of man alone. Now it has never been pretended that these lofty moral motives have been implanted by a supernatural, divine power in the nervous centres of animals. This morality certainly has the same origin both in animals and in man. It springs from the necessities of the social life itself, when the cerebral hemispheres, or the nervous ganglions have acquired a sufficient degree of perfection.

"Let us now recapitulate the general data which have been set forth in the preceding paragraphs. The nervous cellule is an apparatus of impregnation; it retains the trace of the acts accomplished within it, be these acts motive incitations, sensations, impressions or perceptions of ideas. The result of this faculty of impregnation is that a sufficient repetition of inter-cellular nervous acts determines the formation of spontaneous, instinctive tendencies which may become hereditary.

"In this way are formed the instincts of animals and even the series of necessary automatic acts, such as the working of the nutritive functions in man. The concatenation of these acts registered in the memory of the nervous centres is often unconscious; for a sufficient reiteration of acts at first conscious, always tends to render them more or less unconscious. It is by an absolutely similar mechanism that certain altogether special aptitudes arise, inculcated by man in domestic animals. Now these acquired aptitudes may be as strictly hereditary as the so-called instinctive natural tendencies.

"The origin of the former therefore throws a light upon the latter.

"Inductively we may attribute to a spontaneous education, dictated by the necessities of the struggle for existence, acts of devotion, of heroic self-abnegation, and even of social morality which cannot be questioned, and can easily be observed in a number of animals. But man is assuredly only the first of terrestrial animals. Undoubtedly his moral development has been more complete; he has therefore been necessarily affected by analogous processes.

"Let us try to verify this proposition by seeing how moral ideas are formed and implanted in the human brain.

How are human Moral Feelings formed? "Let us remark in the first place that in certain men there exist tendencies which are often hereditary and so contrary to the relative good order of civilized society, that they are declared to be pathological. But these violent and vicious instincts could only have been formed in the midst of primitive societies in far-off times when the moral feelings were still in an inchoate state and when such an inclination, which to-day is stigmatized as criminal, might have been freely indulged in, and might have even caused the individual who possessed it to be esteemed and feared.

Immoral Hereditary Tendencies in Man. "Our penitentiaries, prisons and lunatic asylums enclose within their walls a great number of these offsprings of past ages, whose vicious heredity is unquestionable. Innate and unrestrainable inclinations to theft, murder, rape, incendiarism and drunkenness are far from being rare in our so-called civilized society, and their hereditary transmissibility is beyond doubt.

"At Mettray, Lucas tells us, there were in 1843, thirty-four children whose parents were in prison.

"Out of eighty descendants of a vicious woman, one quarter of them had suffered the penalties of the law, and the other three quarters were composed of drunkards, lunatics, idiots and mendicants.

"It is not unknown at the present day that savage, barbarous and even civilized societies have commenced with cannibalism. Even in our own times, the existence here and there of sometimes hereditary cannibalistic inclinations has been conclusively established.

"Like all instincts deeply incarnated in the nervous centres, these vicious inclinations which cannot be tolerated by the legislation of our modern society, are unaccompanied by any feeling of remorse. 'Inveterate criminals have no moral sense,' says Bruce Thompson, Physician of the General prison of Scotland. Out of about five hundred murderers whom he had known, he was unable to affirm that more than three had felt any remorse at all.

Absence of Remorse in certain Criminals. "Let us listen to another observer: 'Nine-tenths at least of habitual malefactors have neither the desire nor the intention to give up their mode of life. They love the vices to which they are addicted...... Oh, my God! what a fine thing it is to steal! if I had millions, I should like all the same to be a thief,' I have heard a young rascal say.

"If it were a question of inclinations which deserved to be encouraged and were socially useful, this peculiar joy and contentment which accompanies the performance of the act would be called 'moral sanction,' and 'the testimony of the conscience.' It is a question of words and appreciation varying with time and place! In reality, the psychical mechanism is the same in the two cases. The conscience properly so-called, that deep feeling which inspires and recompenses praiseworthy, useful, and heroic actions, devotion and self-abnegation, is also nothing but the result of long ancestral education, and of a certain inherited moral temper.

Origin of the Conscience. "Little by little, by the chances of their social requirements and in proportion to their degree of foresight and intelligence, human societies in the course of ages have prescribed or proscribed certain acts. As we shall see further on, these acts were at first few in number, but their penal sanction was rigorous and often barbarous, and the result of this in primitive societies has been an education, limited no doubt, but masterful and even select.

"In the earliest times, obedience was given to the orders of the priests and chieftains, in a word, of those who wielded power, not because their orders were approved, but because it was perilous to disobey and because the transgressors had to fear the vengeance of men and the gods. But in course of time, this constraint could not fail to produce mental impressions and moral inclinations hereditarily transmissible, to which the majority of men yielded spontaneously, automatically and with pleasure, and which moreover they were unable to resist without feelings of regret or remorse. Then a new and powerful influence came upon the scene and contributed to the fixing of the ethical condition: this was public opinion. We have seen that ants are very sensitive to the approbation of their fellow-citizens; man, as sociable a being as they, is also careful with regard to praise or blame. Henceforward in the conflict of motives determining acts, the so-called moral instincts won the day, even when the individual had neither punishment to dread nor recompense to expect: the conscience was formed.

Unwritten Laws. "There are then what Plato calls 'unwritten laws.' Incest, Plato says, was forbidden by an unwritten law; and, in the matter of religion, the Eumolpides gave their sentences through unwritten laws, which nobody had promulgated and which nobody could abrogate or withstand.

"This idea of instinctive, unwritten laws, superior to positive laws, was evidently very widespread in Greece, since it is met with again in Sophocles' Antigone.

"When Creon reproaches Antigone with having buried her brother Polynices in defiance of the laws, she boldly answers: 'I did not think that the decrees of a mortal such as thou, had power enough to prevail against the unwritten laws the unalterable work of the gods. These are not of to-day or yesterday, they are ever living and none knows their origin. Ought I, forgetting them through fear of the menaces of a man, to incur the vengeance of the gods?'

"Lastly, Aristotle himself, who venerated the written law sufficiently to call it 'a passionless intelligence,' nevertheless adds a little further on: 'The laws which result from manners and customs have still more authority than the written laws.'

"But these laws, written or unwritten, can only result from the manner of life, from the social condition and from the requirements correlative to that condition.

"Darwin is a hundred times right when he says:

'If men were reproduced like bees, our worker females would look upon it as a sacred duty to kill their brothers, and the mothers would seek to destroy their fecund daughters.... The bee acquires these instincts because they are advantageous to the community.' The moral instincts when once fixed and organized in the nervous centres, are bequeathed hereditarily like the animal and functional instincts, but naturally not with the same exactness. Relatively to the latter, the moral instincts are recent; their transmission is therefore irregular and intermittent. Their inherited tenacity is however, far greater than that of the intellectual aptitudes, which are the most fleeting, since they are the last comers and have a transmissibility of only a few generations accorded to them.

Relativity of the Moral Feelings. "The so-called moral inclinations are more solidly established by their being revivified when their cerebral impression has a tendency to become effaced; this is the purpose of written laws, teaching, books, precepts and education.

"That morals and, consequently, the rule of morals, that is to say the moral feelings, are the result of the social condition and the degree of civilization is a truth conclusively proved by history and ethnography. A large portion of this course of lectures will be devoted to establishing this proposition upon a basis of facts; but I shall preface this statement with some general considerations.

"There is nothing more artificial than the feeling of modesty. It is unknown to the whole of the animal kingdom and to all primitive human societies. The Polynesians have never dreamed of it and the Japanese themselves hardly think anything about it. And this evidently acquired sentiment has, among a number of European women, the force and spontaneity of an instinct. When Euripides tells us that: 'even when dying the murdered Polyxenes was careful to fall decently and to hide that which ought to be hid from the eyes of men,' he does not exaggerate in any way, and yet a young Japanese girl, quite as intelligent as Polyxenes, but belonging to another race, bathes naked, without the least embarrassment, among the men, who for their part, are not at all affected at it.

"The truth is that in human society, education and suitable training, provided they extend over a sufficient number of generations, are able almost assuredly to engender such and such a virtue, such and such a vice, or such and such an inclination. In the heroic age of society, when, between small ethnical groups, there was an incessant armed struggle, martial qualities were esteemed, sought for, and recompensed above all others, and they never failed to flourish, as is clearly shewn by the history of Sparta and Rome, and by that of all savage or barbarous societies. To face death intrepidly for the country's sake then became an ordinary act, proceeding from the best known of the virtues. This moral impression has been so solidly fixed during long prehistorical or historical periods that even at the present day, in our industrial or mercantile communities, where to make money *per fas et nefas* has become the supreme aim, the old bellicose spirit revives again in times of war, and in times of peace imposes upon us the foolish custom of the duel, the judgment of God, to which atheists themselves willingly submit.

"It is this old instinct again which returns to life in the heart of modern nations when oppressed, and revives among the enervated descendants the moral verdure of their ancestors. Will it always be so? Evidently not. In order to preserve acquired qualities, the continuation of the education and training is necessary. Undoubtedly in our modern society the mass of individuals must submit to a thousand difficulties, make incessant efforts, and even, in certain professions frequently brave danger and death. It cannot be denied that this training, imposed by the struggle for existence, must develop the will and the faculty of endurance; but it develops these precious qualities in a selfish-direction by removing from the conscience of individ uals submitted to its hard proof, any too legitimate protestations. Unless there is a remodelling of the social fabric, it may therefore be predicted that the societies civilized after European fashion will perish by the least glorious of deaths, that of the effects of wealth. But I shall have to refer to this point at length.

"Taking up again a celebrated proposition of Quételet, Maudsley has rightly remarked: 'It is certain however that maniacs and criminals are manufactured articles just as much as steam-engines and cotton-presses.' This is unquestionable, provided that account is also taken of the tenacious influence of ancestry which contends against or assists the action of the social surroundings which finally are all-powerful. It is from this action that the moral feelings and morality finally depend.

"'Men, d'Holbach justly observes, commonly have neither shame nor remorse, nor repentance for actions which they see authorized by example, tolerated or allowed by the laws, and practised by the greater number.'

"Thus among savages, the rudimentary moral feelings, whatever they may be, are only obligatory in intercourse with members of the tribe. Against a stranger any violence is permitted. The Latin word *hostis*, means both enemy and stranger.

"On the other hand, the social virtues are ordinarily more common and more powerful in small ethnical groups, only forming in a way large families armed in war against neighbouring groups. In our enormous modern societies where, in ordinary times, there is little need to fear for the life or for the purse, individualism degenerates more and more into egotism, and this egotism breaks out with ferocity in political and social crises, during which very excellent persons who are good fathers and good husbands in private life, have been known to commit the most ferocious acts with perfect serenity of conscience. Education and the manner of life form the moral feelings. This is a truth proclaimed by a multitude of facts: in Spain, in Wales, and in the Highlands infanticide is almost unknown, because, in these countries, public opinion is very indulgent as regards feminine fragility.

"A very long moral culture, fortified by a severe penalty, has ended by destroying among the majority of civilized men the inclination for homicide which is so common and so powerful, as we shall see, among primitive societies; but where is the well brought-up man who would refuse to fight a duel?

"In our modern society the love of money is certainly very strong. Everything instigates it. It is the great moral, or immoral, force. However, the horror of theft has been preached for so long, and from one generation to another the thief has suffered such severe penalties from the laws, that poor devils are seen to restore articles of great value to persons far richer than themselves, and often without wishing to receive any reward; the feeling of content within resulting from the performance of a disinterested act, is enough for them. And this is a common case; heroism naturally despises rewards; it finds them in itself.

"Here I will bring my preliminary observations to an end. They were indispensable to circumscribe the ground of our studies, and to indicate their direction and spirit. Essentially, man does not differ from the superior animals. His anatomical structure and his physiological life are identical with theirs; but his conscient nervous centres are able to attain a higher degree of development. In him, as in animals, the nervous cellule is organized to receive and to retain for a longer or shorter period impressions, from which results the aptitude for training and for the formation of hereditary inclinations, which, once implanted, govern the conduct of the individual amidst the conflicts and adventures of existence. I now have to explain how, in obedience to these inevitable laws, the human race has regulated its moral feelings from primitive ages to the present day."

Non-Existence of the Soul, according to Roux.

Going still further than Letourneau, Dr. Joanny Roux proclaims in these terms the absolute affirmation of the non-existence of the soul and of the Divinity, its Creator, in the Introduction to his *Psychologie de l'Instinct Sexuel* (^{1}).

"The time seems to be near at hand for the admission as an unquestionable scientific truth that *all* the phenomena of Nature without exception, are in the final analysis reducible to modes of movements, and as such subject to the laws of general mechanism. Science has little by little repelled the dialectical theories of ancient times, admitting on the one hand a material sensible world, and on the other a more or less immaterial and supra-sensible intelligence which has created the former and governs it.

"Hardly any further objections are made to the formation of the inorganic world by the simple play of natural forces, following laws as absolute and necessary as the laws of mathematics. Hardly fifty years ago, men still supported the intervention of a mysterious principle, supernatural, incomprehensible, not subject to the laws of Nature and the principle of causality, and consequently eluding scientific knowledge, at the present day determinism has definitely triumphed in biology. The researches of Darwin and his successors have thrown a new light upon the formation of the inorganic world. The origin of life is still a problem; it is no longer a mystery. It is no longer allowable, save in the form of a metaphor, to speak of the insoluble mysteries of life.

"Dying Spiritualism has thought to find a last refuge in the phenomena of thought. The partisans of Dualism, which forms the foundation of nearly all religions and of many of the doctrines of philosophy, and which consists in admitting the existence on the one hand of a free and intelligent soul, and on the other of the body, a simple instrument more or less perfected and obedient, have thought to find in that a solid ground and an impregnable fortress.

(1) Paris, J. B. Baillière et fils. 1899.

"Undoubtedly, say the more conciliatory, you have given us a plausible explanation of the origin of the worlds; you have demonstrated the rigorous determinism of biological phenomena; you have brought before us the progressive formation of living beings: let us even admit that you one day solve the problem of the origin of life. There is one ground which it is forbidden you to tread: *the phenomena of thought will always elude your attempts at explanation.* Well! that is not true; there is no reason why the phenomena of thought should not be, like the others, subject to the laws of causality and to a rigorous determinism. We can, we must attempt to penetrate its mechanism. In it there is no longer any mystery. The day on which a mechanical explanation is given to all the phenomena of thought, the final refuge of Spiritualism will be definitively overthrown. The hypothesis of a free soul, more or less immaterial and independent of the body will be relegated to the realms of fancy; it will still be able to inspire the poet and console the sentimental; for the scientist it will have only an historical value.

"Such will be the work of modern Psychology."

The Author's Conclusions. And now that the reader has heard the principal arguments of the two brother-enemies, Spiritualism and Materialism, he will be in a position to form an opinion.

It is possible that man may be a perfected beast, but it is also possible that there is in him some other thing than the beast. Official Science of the 19th century, the direct offspring of the Philosophy of the 18th century, is, (in France at least), unreservedly materialistic. The Naturalists and Physicians who find the nervous cellule at the end of their scalpel and who see it with the aid of the microscope, have not as yet discovered the soul. And that is natural, since death is the result of the abandonment of the body by the soul, or vital principle—if we prefer it. The name is of little importance.

But who will venture to say that the XXth century will not witness the palpable demonstration of the presence of the soul in the body of man. A whole new Spiritualist School has arisen in opposition to official Science. Its leader is is the English philosopher, Sir William Crookes, whose works on the astral body (the envelope of the soul) have been so much noticed. We may also point to the very remarkable studies and experiments of Colonel de Rochas, in France. Official Science denies them and asserts that they are merely a subterfuge of simplicity or of charlatanism. But it will not be able to obstruct for ever. The day on which these experiments, publicly repeated and better understood, furnish irrefutable proofs to the eyes of all, it will be necessary for official Science to acknowledge itself vanquished and again become Spiritualist. The Inquisition was able to condemn Galileo for proclaiming that the earth turned round the sun, but it was not able to arrest the spread of truth.

What a commotion the new Spiritualism will cause in the old Christian religions founded upon the revelation of grace! This however, is neither the time nor the place for discussing it.

Let us keep to our subject. In order to prove that Man is a perfected Animal, an upstart, Naturalist Science has only to furnish one proof. Let it obtain a *product* between an Anthropoid and a Negro, an Australian Aborigine, or a native of Terra del Fuego, the three lowest stages of humanity! If it succeeds in doing so, it will be an *irrefutable* proof! But will it be able? Has the attempt ever been seriously made? Considerable sums have been expended and many lives have been lost in vain efforts to discover the North Pole. The problem of the descent of man appears to us on the other hand to be of supreme importance, and for its solution it will be sufficient to have a dozen anthropoids brought up as soon as they have left the maternal breast with an equal number of negresses. A cry may be raised against the immorality of the proceeding, but that would be of little consequence. Many others occur in the capitals of Europe, and we have ourselves seen acts quite as immoral committed in the colonial wars, even by European soldiers who had nevertheless been brought up under the laws of a strict morality!

CHAPTER XI.

THE SEXUAL WANT, ITS ORGANIC FOUNDATION, ORIGIN, AND ASSOCIATIONS WITH OTHER WANTS.

The Study of the Love of Animals must precede the Study of Human Love.—General Processus of the Generation of Organized Beings.

I. *The Sexual Want.—Organic Foundation of the Sexual Want.*

1. *Origin of the Sexual Want not in the Centres, but in the Periphery.*

2. *Ought the Origin of the Sexual Want to be placed in the Sensations which proceed from the Genital Organs?—Chronological relations between the development of the Sexual Instinct and the development of the Genital Organs.—Castration in Animals.—Castration in Man.—Castration in the Adult Woman.—The Menopause.—After-satisfaction of the Sexual Want.*

3. *The Sexual Want has its Origin in every Organism.—Comparison of the Sexual Instinct to Hunger.—Distinction between Sexual Hunger and the Sexual Appetite.—Psychology compared.*

4. *The causal Excitant of the Sexual Want is analogous to the Causal Excitant of the Nutritive Want.*

II. *The Organic Sexual Want.*

1. *Sexual Centres.*

2. *Conscious Sensation.—Affective Condition.*

3. *Associations of the Sexual Want with other Sensations.*

A. *Associations of the Sexual Want and of the Genital Sensations.*

B. *Associations of the Sexual Want and of the Olfactory Sensations.*

C. *Associations of the Sexual Want and of the Visual Sensations.*

D. *Associations of the Sexual Want and of the Auditory Sensations.*

E. *Associations of the Sexual Want and of the Tactile Sensations.*

F. *Associations of the Sexual Want and of the Gustatory Sensations.—Influences of the Senses upon Pleasure, according to Meusnier de Querlon.—Influence of the Senses on Love in Modern Literature.*

Necessity for studying the Love of Animals before undertaking the Study of Love in the Human Species. Tillier, to whom we shall often refer in the course of this volume, remarks in his preface as follows.

"All our instincts have their origin in animality, and it is consequently above all by studying the manners of wild species, and especially of those whose forms are nearest to our own, that we can hope to find the solution of the numerous and varied problems which are connected with the knowledge of our psychical condition. We have tried, in this work, first of all to seek for the starting-point of the sexual instinct in the series, and then to show that the instinctive impulsion which the male and female of our species obey when they approach and unite for the purpose of reproduction, is the result of slow and gradual modifications which have supervened in the similar instinct which we have inherited from the animals." (¹)

On his side Dr. J. Chevalier is no less affirmative. "It would be puerile at the present day to deny the

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(¹) L. Tillier, *L'Instinct Sexuel*, Paris, Octave Doin.

affinities of every nature which connect man to the rest of living beings. Man is the continuation, and the end, of an uninterrupted series. and it is the glory of the transformist doctrine, in my humble opinion one of the finest discoveries of the age, to have thus demonstrated his animality. The principal functions, in their essential points, are performed in the same way in him as in animals, and this is especially true with regard to the instincts. It is by virtue of this psycho-physiological relationship that it is proper, in order to thoroughly comprehend the forms of his activity, to study the relatively simple forms of that which tends to prove it. From now it is rational and profitable for us to study the phenomena of sexual life from a zoological point of view, that is to say comparatively. The passive observation of animals in a state of liberty, or of domesticity, already constitutes a kind of experimental art, but here we have the advantage of intervening directly and inducing the irregular manifestation of the sexual instinct; by modifying at our pleasure the conditions of existence we can provoke their genesic criminality. To such a factor brought into play, corresponds such a deviation. Although indirect, this means of verifying human perversions is the more precious as the conscience does not come in any way to disturb the experiment. The facts are not falsified by an intelligent will: fraud is impossible, animals are unacquainted with shame and submit themselves unreservedly without moral deliberation to the investigation of their appetites. They do not lie, any more than they give the lie to themselves, or to one another. They do not know how to simulate or to dissimulate. They give to us the naked truth: we should therefore be doubly culpable if we neglected the lessons which they afford us." (¹)

On the other side, Topinard and Letourneau have demonstrated to us the animality of man, We are therefore, definitively, nothing but a very perfected animal, far above the rest of animals, but, corporeally, we are their near relative.

(¹) Dr. J. Chevalier, *L'Inversion Sexuelle*, Paris, Masson.

This being understood, let us put aside the question of the human soul, and concern ourselves merely with man's body which so strangely resembles that of the superior animals. And as, on the one hand, human love has for its cornerstone physiological or sexual love, and as, on the other hand, this is identical in man and in animals, it is logical, before entering on the study of human love to commence with the study of the love of animals.

Let us first show, with Letourneau, the great physiological law of generation, or, in other terms, the common point of contact between the lowest class of animals and man.

General Processus of the Generation of Organized Beings. "Stendhal has somewhere said that the beautiful is merely the prominence of the useful; it might be said, slightly modifying this definition, that generation is the prominence of nutrition. If we examine the processes of generation in very simple organisms, this great function seems to respond to a superabundance of nutritive material, which, after bringing the anatomical elements to their maximum, overflows and promotes the formation of new elements. As long as the new elements can remain associated with those which already constitute the individual, and as long as the latter has not acquired all the development compatible with the design of his being, there is merely an increase. When once it has reached the limit beyond which the species is unable to pass, the organism, I mean the very rudimentary organism, usually reproduces itself by a simple division into two halves. It perishes in doubling itself and in engendering two beings similar to itself which have nothing to do but to increase. It is by this process of bipartion that hydræ, vorticellinæ, acalephæ, algæ and the more simple kinds of mushrooms are multiplied.

"Among slightly more complicated organisms, the function of reproduction tends to become specialized. The individual no longer divides itself completely; it produces a bud, which gradually increases and detaches itself from the stock-organism to pass in its turn through the limited adventures of its poor existence.

"Through a still more advanced degree of specialization, the function of reproduction localizes itself in a special cellule, an ovule, and the latter by a series of segmentations and bipartitions engenders a new individual: but, generally speaking, it is then necessary that the cellule, destined to be multiplied by segmentation, should first be coalesced in conjunction with another cellule. By means of various organic processes, the two generator cellules attain contact; then the element which must be divided, which is called the female element, absorbs the merely impulsive element; the element which is called male impregnates it, and from this moment it is fertilized, that is to say it is fit to follow the course of its formative work.

"This simple phenomenon of the conjunction of two cellules is the basis of generation in the two organic kingdoms, as soon as the sexes are separated. It is no matter whether these are represented by distinct or united individuals, or whether the accessory organic apparatus is more or less complicated; the essential fact always and everywhere consists in the conjunction of two cellules, with the absorption, in superior animals, of the male cellule by the female cellule.

"This process is seen in its most elementary form in the algæ, named conjugatæ. In order to form a reproductive cellule, a spore, two neighbouring cellules put forth a prolongation to one another; these projections meet and their walls absorb one another at the point of contact; then the protoplasms of the two elements mingle together and, in the end, the two cellules coalesce into a single reproductive cellule, (*Spirogyra longata*).

"Between this marriage of two inferior vegetable cellules, which exactly realize the well-known saying in the Bible, 'they make but one flesh,' or rather one protoplasm, and the primordial phenomenon of fecundation in the superior animals, including man, there is no essential dissimilarity, the ovule of the female and the spermatozoa of the man coalesce in the same manner, with the only difference that the female cellule, the ovule, retains its individuality, absorbs the male cellule and is impregnated by it. But, slightly complex as it may be, this phenomenon of fecundation is the very reason of the duration of bisexuated species; it is owing to it that organic individuals, all more or less ephemeral:

> "Pass on the torch of life as they run."
> LUCRETIUS.

"For a number of organized beings, reproduction in fact seems to be the supreme end of their existence. A quantity of vegetables and animals, even of animals of high rank in the series, as insects, perish as soon as they have accomplished this great duty; sometimes the male dies before he is detached from the female, and the latter itself survives only long enough to lay its eggs. Instead of laying, the female cochineal insect fills itself with eggs to such an extent that it dies and the tegument of its body forms a protective covering for the eggs, etc. At the time not so far removed from us when animism reigned supreme, these facts were attributed to calculations of finality; Nature, it was believed, preoccupied itself above all with perpetuating organized species; as for individuals, she scorned to care for them. We now know that Nature, as an anthropomorphic personage, does not exist; that the great forces which are called natural are unconscious, and that from their blind action a choosing, a selection, a progressive evolution results in the living world, and, to sum the matter up, the survival of the individuals best adapted to the conditions of their existence. Without any intention of Dame Nature, the conservation of the species must necessarily have been the object of selection before anything else, and in the course of geological periods, primitive bipartition has become by little and little, through progressive differentiation, bisexuated generation, requiring for its accomplishment the co-operation of special and complicated apparatus. But at the same time as generation, other functions were also differentiated by the formation of special organs; the nervous system vegetated around the *Chorda Prima*, and finally the life of consciousness awoke in the nervous centres. After that the performance of the great function of generation assumed a totally different appearance. In the lowest degrees of the animal hierarchy, reproduction was effected mechanically and unconsciously. A paramecia observed by M. Babiani, produced in 42 days, by a series of simple bipartitions, 1,383,116 individuals which assuredly had not the slightest notion of the phenomena by which they transmitted existence. But, in superior animals, it proceeds quite differently: the act of generation is a real efflorescence not only physical, but also psychical. It would be useful for the study which I have in hand to recall the principal features of this amorous efflorescence, since it is, in the end, the first cause of marriage and of the family. But, in order that we may not get out of our depth, it is important to remember always that, at the bottom, all this expenditure of psychical and physical force has for its motive and result, in man as well as in animals, the conjunction of two generatory cellules. Regarding this, Haeckel has written in his Anthropogeny a true dithyramb, so absolutely true that I will give myself the pleasure of quoting it: 'Everywhere in living Nature, small causes produce great effects..... Think of how many curious phenomena sexual selection occasions in animal life; think of the results of love in human life; now all that has for its motive the union of two cellules..... there is no organic action which can, even distantly, rival this in power and force of differentiation. The Semitic myth of Eve who seduced Adam for the love of knowledge, the old Greek legend of Paris and Helen and many other beautiful poems simply express the enormous influence which love and sexual selection have exercised since the separation of the sexes. The influence of all the other passions which agitate the human heart cannot enter into comparison with that of love, which inflames the senses and fascinates the reason. On the one hand, we celebrate in love the source of the noblest works of art and the most sublime creations of poetry and of music; we venerate it as the most potent factor of civilization, the primary cause of family and, consequently, of social life. On the other hand, we dread love as a destructive flame; it drives many unhappy creatures to their ruin; it has brought forth more misery, more vice, and more crime than all other calamities put together. Love is so wonderful, its influence on the psychical life and the most varied natural functions of the nervous system is so enormous, that as regards it, we might be tempted to have doubts of the supernatural effect of our natural explanation. Nevertheless, comparative biology in the history of development leads us surely and indubitably to the oldest and most simple source of love, that is to say to the elective affinity of two different cellules; the spermatic cellule and the ovular cellule.'"

Letourneau. *loc. cit. (L'Evolution du Mariage et de la Famille.)*

The Sexual Want. All animate beings, in the whole series of the organic world, yield irresistibly to the sexual want, the object of which is the conservation of the species. Everything, in fact, yields to the want of love physiologically. The pollen of flowers, borne along by the breeze, comes to fecundate the female organs; the vermicule in the grass swoons with pleasure. "The bird has a female which it loves; the fish in the midst of the waters finds someone with whom to taste the pleasures of love; the stag runs after the hind; the serpent unites with the serpent; the dog remains attached to the bitch after accouplement; the ewe enjoys being leapt by the ram; the he-goat, repugnant as he is, is not displeasing to the lascivious she-goat; the mare, burning with the fires of love, goes to rejoin the stallion far away, and leaps across the streams which separate them." This is the description given by Ovid in his *Ars Amoris.*

In man, says Dr. Laurent (¹), this want is quite as great. The day after a bloody conflict, in the midst of a wide plain where the dead lay scattered all around, Napoleon made this reflection: "One night of Paris will make up for all this." If he could thus express himself, with a victor's brutality, it was because he knew that the physiological pleasures of love rule the whole human race and are always the prelude to its recovery of youth.

Has this *sexual love,* or rather this *sexual want,* from which proceeds the physiological union of the sexes, a basis which may serve as a starting-point for our comparative study of love in the animal series?

Instead of giving at this point the more or less contradictory opinion of several writers, we prefer to study that one only who appears to give the best summary of present Science, and we shall proceed to analyze and quote almost *in extenso* the work by Dr. Joanny Roux, which has appeared quite recently and may be compared with the writings of the masters of official science.

I. ORGANIC BASIS OF THE SEXUAL WANT.

1. **The Origin of the Sexual Want is not in the Centres but in the Periphery.** "It will not appear doubtful to anyone that the first origin, the *primum movens* of psychical phenomena of the sexual order must be sought for in the periphery. To each want perceived by the Consciousness corresponds a more or less specific sensation, carried to the brain by the centripetal nervous system. To the sexual want, to the 'want of love' correspond one or more sensations the origin of which it is our task to determine.

"A few years ago, it was usual for each function to seek for a corresponding cerebral centre whose office

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(1) Laurent. *L'Amour Morbide.*

it was to govern it. The organism was thus divided into a certain number of departments, each of which had its representation and direction in the corticality. We shall see further on what must be thought about the 'sexual centres.' But, even admitting this doctrine of autonomous and distinct centres, an attempt must still be made to discover under what influence they perform their functions, and by what incitations of peripheric origin they are brought into play. Certain authors however, seem to admit that the sexual want originates directly and spontaneously in the centres. In this there is a manifest error, 'against which all the recent data of physiology and even of histology protest. The nervous centres never perform their functions spontaneously *in the normal condition:* all cerebral activity has its origin in the periphery, in the centripetal nervous system, just as it has its echo in the centrifugal nervous system. Any neurone receives its nervous influx either from anatomical elements, (sensible peripheric nerves), or from another neurone; it does not create any spontaneously in the normal condition.

"It is therefore in the sensitive nervous system that we must seek for the origin of the sexual want."

2. **Origin of the Sexual Want. Must it be placed in the Sensations which proceed from the Genital Organs?** "Few authors have explained themselves with clearness upon this subject. Almost all those who have directed their researcles to it have made the sexual want to originate in the genital organs. 'The sexual life, says Krafft-Ebing (¹), first manifests itself by sensations proceeding from the sexual organs in course of development.' And in another place: (²) 'In the sexually ripe individual there is an intimate correlation between the working of the genesic glands and the degree of his *libido.*' Then, after recalling however, the case of eunuchs and women remaining or becoming sensual after the menopause: Experience

(¹) Krafft Ebing. *Psychopathia Sexualis.*

(²) Ibid.... Ibid.

teaches us that the *libido* has for its essential condition the function of the genesic glands, and that the facts which we have just quoted only constitute exceptional phenomena."

"Beaunis (¹), gives utterance to the same opinion: The organs of generation and their annexes hastily developed become the starting-point of absolutely new sensations, hitherto unknown, which react on the whole nervous system and modify profoundly the intelligence, the sentiments, the habits and the character. Then, after giving an excellent description of these new sensations and of the corresponding sexual want: The sexual want, he says (²), is tied to the presence of the seminal elements, male and female, spermatozoïd and ovule. Therefore all the causes which, in one way or another, suppress the production of these two elements, (castration, age, diseases, etc.), annul the sexual want and prevent its appearance.

"Delbœuf (³), again upholds the same thesis when he admits that, in all the acts connected with the sexual instinct, the spermatozoid or the ovule assumes the direction of the individual.

"Tarchanoff states still more precisely the starting-point of the sexual want and believes that it is connected with the repletion of the seminal visicles. His experiments on the frog are summed up by Beaunis as follows: It is possible, as Spallanzani has already observed, to mutilate in every way a male at the moment of accouplement, without the accouplement ceasing. Tarchanoff has extirpated the heart, the lungs, and even the testicle with the same negative result, while the extirpation or simple section of the seminal vesicles which emptied them of their contents immediately caused the accouplement to cease, or prevented it from being produced, if it had not been commenced. The simple dilatation of the seminal vesicles by an

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(¹) *Sensations Internes.*

(²) *Ibid.*

(³) Delbœuf. *Pourquoi mourrons-nous?* Revue Philosophique, 1891, p. 257.

inert liquid, milk for example, was on the other hand sufficient to produce an artificial sexual want. To sum up, in the frog, the sensitive excitation which awakens the sexual want proceeds from the seminal vesicles and is transmitted through the nerves of these vesicles to the nervous centres. A special excitability of these centres is thus produced, corresponding to the sexual instinct, and owing to which the least excitation proceeding from the female in a state of rut occasions movements in the male appropriate to the research for the female and to accouplement.

"Formulated in precise physiological terms, these different theories may be summed up in the following manner: when the genital organs have acquired their full development and are fit to perform their function for the reproduction of species, they become the starting-point of a centripetal nervous impression. This rises towards the centres, causes the sexual desire to break out in the consciousness, and is the *primum movens* of all the acts connected with the genital life. The sexual want under all its forms, from the brutal desire of accouplement to the most delicate manifestations of love, thus becomes analogous to the want to urinate or to defecate. It would be nothing else than an organ which demands to perform its function, seminal vesicles which demand to be emptied.

"This theory ought to be seriously discussed: we have before us to-day a sufficient number of facts to judge of the amount of truth which it may contain. It supposes first of all, that the sexual want does not make its appearance until after the development of the genital organs: we shall have to see in what sense the facts speak regarding this. If the only basis of the sexual instinct is the want of the genital organs to perform their functions, it ought never to appear when they are not fit to perform their functions, (castration before puberty); it ought to disappear when the genital organs are suppressed organically or functionally, (castration, menopause, diseases, etc.). Finally, the sexual want ought to disappear entirely when it is organically satisfied by coition. We will examine successively the corresponding series of facts.

Chronological Connections between the Development of the Sexual Instinct and the Development of the Genital Organs. "There is but one sure criterion which permits us to affirm that the genital organs are completely developed, and that is fertile coition. It is very nearly impossible to fix the precise date of that in man. The cases of precocious maternity will help us, on the other hand to determine the minimum age at which the genital organs of the woman may become fit to normally perform their functions. Menstruation would be an untrustworthy guide for that, for frequently it has not yet made its appearance when fecundation and child-bearing are already possible.

"The cases of precocious maternity, observed in temperate climates, were all noticed on the occasion of a communication by Dr. Sage, (of Bordeaux), concerning a French girl fecundated at the age of twelve years and nine months, who had completed her term of pregnancy and had given birth to a fine and normally constituted child. This would be the first case of such precocious maternity observed in France. Among the cases brought to notice on that occasion, we will merely point out those of Dood, (nine years and eight months; Roberton, (twelve years and three months); Taylor, (twelve years and six months); Rowlett, (ten years); Gleaves, (ten years and two months); Curtis, (ten years, eight months and seven days); Bousquet, (twelve years and eight months), etc. (1)

"Taking these exceptional cases as the minimum limit at which fecundation is possible, we see that the genital organs never have acquired their development before the age of nine years. In the normal state, this limit is deferred at least five or six years. If the theory which we have stated above is true, the sexual want ought never to make its appearance before the age of nine, nor to manifest itself normally before the age of thirteen or fifteen.

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(1) The figures indicate the date of accouchement.

"Most frequently, in fact, the instinct scarcely manifests itself in visible fashion until after puberty, and this is one of the conditions of its remaining normal and not undergoing any deviation. But does it always remain so? Innumerable cases exist in which the extremely precocious appearance of the sexual want has been pointed out. It has been noted from the age of four or five years in a very great number of observations of sexual pathologies, (Marc, Lombroso, Zambaco, Krafft-Ebing, Moll, Chevalier, etc.); this precocity is very frequent in degenerates, it is almost invariable in idiots and imbeciles. Krafft-Ebing is embarrassed by this premature awakening, after having eliminated the cases in which it appeared to be under the influence of peripheric causes (phimosis, balanites, oxyures, etc.). 'We must separate, he says, from all these cases those in which, without any peripheric cause, but solely through cerebral processes, the child evinces sexual desires and inclinations.'"

"Sollier (¹) has laid stress upon the sexual precocity of idiots and imbeciles.

"'We have on more than one occasion observed idiots of a very inferior intellectual level, evincing pleasure from the age of four or five years upon contact with young girls and women. Some of them try to violate their little sisters, or to touch them in an obscene manner. One we knew who made an attempt upon his mother whose petticoats he lifted up. How frequently, in asylums for idiots, we see patients who like to touch their female nurses and to have contact with them, putting themselves thereby into a state of general excitation.'"

"Among complete idiots, precocious masturbation, long before the development of the sexual organs, (which besides is very late), is very frequent.

"These are, it is true, pathological cases; they in no way prove that the genital organs when fully developed play no part in the evolution of the sexual instinct.

(¹) Sollier. *Psychologie de l'idiot et de l'imbécile.*

They simply prove that the sexual want *may* make its appearance before the complete development of the genital organs, and consequently *is not solely dependant upon them.*"

Castration in Animals. "'Veterinary surgeons have communicated a great number of facts which are highly significant upon this subject, and they have been stated very ably by M. Guinard in his excellent article (¹). Sexual ardours are frequently observed among Hungarian horses. According to the veterinaries of the remount Department, 2 to 3 per cent. of them display genesic ardours and perform coition, without any results as regards fecundation. Castration is sometimes employed to calm the ardours of nymphomaniac mares: frequently the object is not attained and the sexual instinct continues.'

"'Guinard concludes from his researches: There is therefore no serious physiological reason why castration should stifle for ever the sexual appetites and be an absolute obstacle to the normal execution of the venereal act.'"

Castration in Man. "We must distinguish the cases in which castration has been performed in infancy from those in which it has not taken place until after puberty and the awakening of the sexual instinct.

"It is difficult to know precisely what the sexual instinct is among eunuchs. Regarding those in the harems of the East, we only have information which is open to suspicion or which is contradictory. They would not be always insensible to the charms over which they watch. Therefore, in certain harems only those eunuchs are admitted who have undergone the total amputation of their external genital organs.

"'Even when completely impotent, they still retain desires. The unhappy being who survives his nullity still sees in a woman, if not pleasure, at least an image of pleasure; he flutters round this phantom and attaches

(¹) Guinard. *Dictionnaire de Physiologie de Richet.* Art. Castration.

himself to it; he cannot separate from it and, in default of the true enjoyment, enjoys at least his temptations.' (Roussel).

"Habits of passive pederasty have not been rare among the singers of the Sixtine Chapel. But in this must be seen the result of the vice of the active agents, and not the persistence in the passive agents of an inverted sexual want.

"There is the same lack of information in the cases, which moreover are rather rare, of surgical castration. In all these cases, the external genital organs remain athrophied; coition is impossible; the sexual instinct, even if it still exists, cannot manifest itself normally, and the individuals are careful to pretend that it does not exist.

"We have more precise information with regard to the effects of castration after puberty. It is certain that after the ablation of both testicles coition remains possible. This possibility of coition without fecundation was highly appreciated by the Roman ladies.

"Richet has noted that in one of his patients, three years after the ablation of both testicles, coition was as easy as it was before. The law of Missouri inflicts the penalty of castration upon those guilty of rape, and some of them again become guilty of the same crime. Talbot and Ellis report an interesting case of congenital sexual perversion in a young man. Both his testicles were removed; he continued to have erections, to masturbate himself and to pursue with his attentions the young man he had selected for his lover; in consequence of the latter's refusals he shot him twice with a revolver (1).

"'In subjects of the human species, says Guinard, it is proved that proportionally the persistence of the genital sense after castration is more frequent than in animals.'"

Castration in the Adult Woman. "There are numerous observations regarding this, supported by adequate testimony. Castration has been performed a very great number of times during the past thirty years. Almost all surgeons draw attention to the frequent persistence of the sexual instinct and of voluptuous genital sensations. We are content with giving Glævecke's and Jayle's statistics.

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(1) Talbot and H. Ellis.—*Journal of Mental Science*, April, 1896.

According to Glævecke (1), the venereal condition is modified in the following proportions:

The Sexual Desire	persists	in 6 cases	= 22%
	is diminished	in 37 cases	= 37%
	is extinguished	in 11 cases	= 41%
The pleasure during Coition	persists	in 8 cases	= 31%
	is diminished	in 10 cases	= 38%
	is extinguished	in 8 cases	= 31%

"Jayle (2), has applied a very complete interrogatory to all the women he has operated upon. As regards the sexual instinct he has put to them the following questions: Have you any venereal desires? Did you have them before? Are they similar? Do you feel any pleasure? Did you feel any before? Is it the same?

"Three hundred patients have been examined in this manner.

"The results obtained were as follows:

"1st. *Ovarian Castration.* Out of 33 patients, the venereal desires have remained the same 18 times; they have been diminished 3 times, abolished 8 times, augmented 3 times. The pleasures have remained the same 17 times; they have been diminished once, abolished 4 times, augmented 5 times; 6 times the relations have been painful.

"2nd. *Utero-ovarian castration.*—Out of 13 patients, the desires have remained the same 5 times; they have been diminished 3 times, abolished once, augmented twice. The pleasures have remained the same 4 times;

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(1) Glævecke. *Arch. für Gyn.* Bd. XXXV. 1889.

(2) Jayle. Effets physiol. de la castration chez la femne. *Rev. de Gynecologie et de Chirurgerie abdominale.* 1897.

they have diminished twice, augmented twice; once the relations were painful,

"3rd. *Simple Uterine Castration.* Out of 11 patients, the desires have remained the same 5 times; they have been diminished 3 times, abolished once, augmented twice. The pleasures have remained the same 4 times; they have diminished twice, augmented twice; once the relations were painful."

"Jayle notes 'that it is very probable that auto-suggestion here plays a considerable part, many patients being persuaded that after castration *they ought not any longer to be as other women.*'"

Menopause. "The involution of the genital organs which is produced after the menopause ought to have the same results as their ablation. There is no need however, to recall the fact that the sexual desires often survive, sometimes become more acute, and may even not make their appearance until *after the menopause.* In this last case, the acuteness of the desire is the greater as it cannot attain a complete satisfaction."

After-satisfaction of the Sexual Want. "Lastly, there is no need to insist on this common observation that coition, the satisfaction demanded by the genital organs, is far from always satisfying at the same time the sexual want; that the latter often still exists when the genital organs do not ask for any more."

Conclusion. "From all these facts, one conclusion is clearly evolved. Undoubtedly the sensations which have their starting-point in the genital organs when they have attained their full development are of the highest importance for the *normal* evolution of the sexual instinct. *They are not indispensable for the appearance* of this obscure but imperious desire which takes possession of the adolescent, of this irresistible impulsion of the sexes one towards another. In the sexual want there is something else than an organ which demands to perform its functions, something more than seminal vesicles which want to be emptied."

3. **The Sexual Want has its Origin in the whole Organism.** *Internal Observation.*—"What information do we receive on this subject from internal observation? This is a subject which on innumerable occasions has attracted writers and poets; their observations are frequently not lacking in accuracy, and they have correctly noted the psychological phenomena which mark the awakening of the sexual life. Look at this young girl who has been brought up in absolute ignorance of all things pertaining to love: but yesterday she was gay, smiling, frolicsome, amused at trifles, she woke up with a song and fell asleep with a smile: to live was her only function. But a new sensation has dawned in her consciousness, vague and obscure at first, it has increased with rapidity and pressed itself upon her attention, occupying her mind and driving from it all else that engaged it. What was at first but a kind of restlessness and uneasiness not without its charms, a confused desire for something unknown, has soon acquired all the force of an obsession.

"To her songs, frolics and childish amusements, have succeeded long reveries, solitary walks, sudden and inexplicable fits of weeping and sleepless nights full of musings. It is the meditation of the species preparatory to its perpetuation.

"And yet this young girl has no suspicion hitherto of the nature of the disorder to which she is giving way. She finds this unknown sensation not without its charms, laying hold of her completely, strong enough to detach her from all that formed her life, but still not clear enough as yet to point out what lies before her in the future.

"It is very difficult to see in all this merely the result of sensations proceeding from the genital organs: the latter do not as yet occupy any place in our young girl's mind. She feels a want *which she does not localize;* it is her whole organism which suffers and demands a satisfaction of which she has as yet no idea. She no longer lives for herself alone; it is through her that the species is about to pursue its ends. A new function is in process of development and the new sensation which has just invaded her impels her irresistibly to its satisfaction.

"Though they are less evident in the man, who is better informed, the psychological phenomena of the commencement of the sexual life are essentially the same. 'I was, says Rousseau, restless, pensive and absent-minded; I shed tears, I sighed, I desired a happiness of which I had no idea, but the deprivation of which I felt nevertheless.' (1)

"At the beginning, the sexual want has therefore all the characteristics of a general want of the whole organism. It is like a sap, drawn into all the cellules of our economy through the radicles of the sensitive nervous system, and brought to the centres, where it induces a vigorous growth of new sentiments. It is a new force which galvanizes the individual and can make him accomplish the greatest things, unless it sacrifices him entirely to the Species.

"The genital sensations appear scarcely to intervene except to point out the new path, the object to be attained, and to produce desire for the expected satisfaction."

Comparison of the Sexual Want to Hunger.

"The sexual want may very well be compared to hunger. It is now conclusively established that the latter has its origin in the innumerable cellules of our body. It is the cry of our organism demanding nutritive material, when the internal medium is impoverished. For a long while, however, it was believed that the sensation of hunger had its source in the stomach, as it is still believed that the sexual want has its origin in the genital organs.

"The fact is that two very distinct things are confused: a *general* want of the whole organism which, for the nutritive functions, is hunger, for the functions of reproduction, the sexual want, and a *local* want, which is the *appetite* in the former case, the *desire of the genital satisfaction* in the latter.

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(1) J. J. Rousseau, *Confessions*.

"In a previous study, we applied ourselves to differentiate the *appetite* from the *sensation of hunger:* We believe that the stomach is often the starting-point of a special sensation. But this is very different from the sensation of hunger, which moreover it often precedes. The sensation of hunger is a sensation *sui generis* which, for this reason, is as difficult to define as the auditory or the visual sensation; it is according to a favourite expression of sick people, a want to have something?

"'The sensation of stomachic origin is quite opposite to the painful sensation when it has acquired a certain acuteness. These two sensations are besides so different that they are often found dissociated.

"'During digestion, the glandular cellules excrete all their contents.... In the interval of repose, they elaborate afresh the material of these excretions.... There is nothing irrational in supposing that here there is a starting-point for a special sensation. After a long repose, we feel a want to exercise our muscles. Why should not the stomach also demand to perform its functions?

"'The stomachic sensation awakens in our mind the idea of eating, the remembrance of agreeable dishes and the prospect of a savoury repast; in all that, there is nothing else but that which has been dignified by the name of *appetite.*

"'In our opinion, the appetite is nothing else than the desire suggested by a crowd of memories, which are themselves awakened by a special stomachic sensation....'"

Distinction between the Sexual Hunger and the Sexual Appetite. "An absolutely similar distinction may be made with regard to the functions of reproduction: there is a *sexual hunger* and a *sexual appetite.* The sexual *hunger* is nothing else than that sensation the appearance of which we have just described in the young girl. It is a specific sensation, which in virtue of this can be described but cannot be defined. Like the real hunger, it has its origin in the whole of our organism. The sexual *appetite* is nothing else than the desire of the genital satisfaction; it is merely an organ which demands to perform its functions; its origin is in the sensations proceeding from the genital sensations. The latter awaken in our mind the idea of sexual intercourse, the remembrance of agreeable moments and the prospect of a delicious thrill.

"Just as the nutritive *appetite* is satisfied by the repletion of the stomach, whatever be the nutritive value of the food introduced, the sexual *appetite* is satisfied by sexual intercourse, whatever be the object of it.

"Real *hunger*, on the contrary, only disappears when the impoverishment of the nutritive medium is repaired by suitable food; in the same way, the sexual *hunger* is only satisfied in the union of two beings who have selected one another by virtue of mysterious affinities.

"From the sexual hunger is derived love; the sexual appetite can only engender desire.

"The part played by the sensations proceeding from the genital organs must not therefore be denied, but it ought to be restricted. Tarchanoff removing the seminal vesicles of frogs, the surgeon or the veterinary performing the ablation of the genital organs, suppress only one of the elements of sexuality, we may even add the least important. The immense, irresistible force which impels the sexes towards one another has its origin elsewhere: it takes root in our whole organism, in the inmost depth of our being. *We love with our whole body.* Not one of our anatomical elements is unconcerned in the functions of reproduction.

"Besides this, lovers know very well how to make this distinction between the sexual hunger and the appetite or desire. 'It is a want of the soul:'—we shall often hear this said, and by this remark it is meant to indicate the feeble part of the desire of genital satisfaction. For others it is the search for the 'sister soul.' Let there be no deception however, about this:

the almost necessary result is the intercourse of the sexes."

Psychology compared. "Psychology when compared can supply us with a striking argument from our point of view. For this purpose we shall take an enormous leap: from man we shall descend to Protozoa.

"For some time past phenomena of *conjunction* have been observed in the Infusoria which have been compared to fecundation. These phenomena of conjunction consist in this: two Infusoria unite, couple together and appear to fuse into a single individual; their micronucleus divide; they exchange the eighth part and then separate. From this species of accouplement results a redoublement of energy, a kind of rejuvenescence: Maupas gives it the name of *karyogamic rejuvenescence.*

"We see immediately the analogy with what takes place between the ovule and the spermatozoid. But there is a still more interesting fact: the accouplement of the two Infusoria is no more left to chance than the junction of the ovule and the spermatozoid. 'A superior instinct, says Balbiani, seems to rule all these little creatures; they seek for and pursue one another, they go from one to another, feeling by means of their hairs, they agglutinate for some moments in the attitude of sexual intercourse, then they part to catch one another again. These singular games by which these animalculæ seem to provoke one another to accouplement, often last for several days before the latter becomes definitive.' All these phenomena, submitted to a rigorous determinism, are explained by physico-chemical actions, by *tropisms*, according to the scientific language of the present day. It will not however, be denied that in this case there are phenomena absolutely analogous to what takes place in man. If we may be allowed the use of anthropomorphic language which renders it more easy of comprehension and at the same time affords a happy comparison, without involving anthropomorhic error, (we shall not be accused of falling into this error, since, even in the case of man, we admit that everything is reduced to physico-chemical actions, to tropisms), we might say that the Infusoria *feel* the sexual want, *try* to satisfy it and *choose* their partner.

“But here is something that interests us more directly still. Maupas (1) has succeeded in determining *under what conditions this sexual want* arises. His researches have been directed to the *Stylonichia pustulata*: these Infusoria are multiplied by bipartition. Starting from a Stylonichia rejuvenated by conjunction, Maupas has been able to follow its successive bipartitions, as far as its 316th agamous generation without any fresh conjunction. At the beginning these Infusoria are gifted with great vitality; at the end of a certain number of generations, this vitality diminishes and at the same time the size is reduced. To use Maupas' expression, a veritable *senile degenerescence* is produced, the senility being understood as of the race and not of individuals.

“If the experiment is pursued, accouplement and karyogamic rejuvenescence being prevented, at the 316th generation nothing but sterile abortions are obtained. It is the extinction of the race; it is death. Accouplement, conjunction, kyrogamic rejuvenescence, such is therefore the indispensable condition of the immortality of the germinative plasma.

“Up to the 130th generation, the *Stylonichiae* do not appear to have any tendency to this accouplement: the agamous generations continue and the individuals to which they give birth are active. At the 130th generation appeared the sexual want, such as it is described by Balbiani. If the conditions permit it, accouplement is effected, and from this results a rejuvenescence which permits the Infusoria to commence a new cycle of agamous generations. If accouplement is rendered impossible and the agamous gener-

(1) Maupas, Recherches expérimentales sur la multiplication des Infusoires ciliés (*Arch. de zoologie expérimentale*, 1888, No. 2). Le rajeunissement karyogamique chez les ciliés (*Arch. de zoologie expérimentale* 2e série, VII, 1889, p. 412-413).

ations are pursued beyond the 130th generation, the individuals, at the same time as they are affected with senile degenerescence, show a gradually lessening tendency to accouplement; the sexual want seems less energetic; the unions, when they take place, are less and less happy. After the 230th generation, accouplement is not effected; the offspring is irremediably devoted to extinction which occurs at about the 316th generation.

"Thus in the Infusoria, there is at first produced a series of agamous generations, then sexuated reproduction becomes necessary, and then the sexual want appears. It is a want of the race displaying itself in some individuals only, at a period of the race's evolution.

"Let us now make a comparison with what takes place in superior animals and man. Like the *Stylonichiae* studied by Maupas, the cellules, descendant from the fecundated ovule, are multiplied actively by a series of successive bipartitions. From this results our organism which is, in short, comparable to an agregate of Infusoria.

"We have seen that at the end of a certain number of agamous generations, the want of a karyogamic rejuvenescence makes itself felt in the Infusoria. The same fact is observed in man: in the child, the sexual want has not yet made its appearance; it does not show itself until our anatomical elements are multiplied to constitute our body.

"All Infusoria which do not consent to accouple soon lose the sexual want, and then travel on to extinction and death: the appearance of the sexual want marks the commencement of this journey. In man also, every anatomical element which is not fecundated gradually perishes.

"While in the descendants of Infusoria, the majority, if not every individual, were fecundated, in the descendants of an ovule, there is only a very small number of elements which can be fecundated. But *all experiencing the same phenomena of senile degonerescence,* *must experience the same want of fecundation.* While, in an aggregate of Infusoria, this want is individual and peculiar to each individual, in man this want is no longer individual, it becomes collective. This results from the division of labour. For the better understanding of the matter, may be we allowed an example and a comparison.

"The unicellular creature is capable of seizing and digesting its food itself. In pluricellular creatures, this function devolves upon a certain category of cellules. When the other cellules are in want of food, they address their demands to those whose office this is. This is the origin of the sensation of hunger. In consequence of the impoverishment of the nutritive medium, there is produced 'a state of suffering of our anatomical elements. This state of suffering is translated through a special excitation of the corresponding nervous extremities; from this there arises a nervous impression which rises towards the centres.'

"In the same manner we shall say: the Infusoria may be fecundated and thus found another generation. Among pluricellular creatures, this function devolves upon a certain category of cellules. When the other cellules experience the corresponding want, resulting from the commencement of degenerescence, they address their demands to the elements which have the office of reproduction. This is the origin of the sexual want. In consequence of *senescence*, a state of suffering of our anatomical elements is produced. This state of suffering is translated through a special excitation of the corresponding nervous extremities; a nervous impression arises from this which ascends towards the centres."

The Exciting Cause of the Sexual Want is Analogous to the Exciting Cause of the Nutritive Want. In the case of the sensation hunger, we know what is the physico-chemical change which produces the excitation of the nervous extremities; it is the impoverishment in nutritive material. We are as yet ignorant of what is the physico-chemical change which is at the origin of the sexual want, on a level with the anatomical elements; we must be content with the vague word *senescence*. Maupas believes that it refers to a disorder of nutrition, applying not to the medium which is the same, but to the Infusoria themselves: the latter have less assimilatory properties.

"This diminution in the faculty of assimilation may perhaps be made up by a parallel augmentation in the quality or the quantity of the food. Maupas does not bring forward any conclusive fact as regards this, but we can find them elsewhere. During the whole of the summer Plant-lice are reproduced parthenogenetically; there being no need of males, these parthenogenetical generations give birth only to females. During all this period, consequently, there is no sexual want—and everything takes place as in the case of Infusoria, up to the 130th generation. At the approach of winter, the sexual want appears among the plant-lice; males are born which fecundate the females; the generations become sexuated. Among plant-lice, therefore, as among Infusoria, the sexual want appears periodically. But here there is a very important fact: if the plant-lice are kept in a greenhouse and supplied with *good* food, the parthenogenetical generations continue and the sexual want does not make its appearance. The latter is therefore in a certain measure subordinate to the functions of untrition.

"The following facts may be considered as belonging to the same order: the wasp engenders more females and fewer males when it is supplied with abundant food. Among sexuated plants, the males are more abundant in proportion as the conditions are unfavourable, etc.

"*The sexual want therefore would be, definitively, only one of the aspects, a modality of the nutritive want.*"—DR. JOANNY ROUX.

This quotation, although somewhat lengthy, appears to be necessary, because it gives the key to the origin of love in animal nature. Let us carefully bear in mind this double definition, so clear and yet so simple, a veritable law which the author has the merit of being the first to formulate:

Love is derived from the sexual hunger: the sexual appetite can only engender desire.

Having laid this down we shall continue to take Dr. Johanny Roux our guide and study with him what he calls the organic sexual want.

II. THE ORGANIC SEXUAL WANT.

In the preceding chapter the Author has established the fact that at the origin of the manifestations of the sexual instinct there was a nervous impression taking its rise in the periphery, on a level with all our anatomical elements.

It is almost certain that this nervous impression has no special conductors, it merely follows the nerves of the general sensibility.

We know absolutely nothing of the inferior reflexes to which it gives birth.

1. **Sexual Centres.** The question of the Sexual Centres has been treated by us at some length in the 2nd Volume of the *Ethnology of the Sixth Sense.* Dr. Roux's opinion is sensibly different from our's. We have adopted, as being the most scientific, the theories of Magnan who distinguishes three centres hierarchically superposed, the harmonic working of which gives the *normal* sexual instinct. If, in consequence of a want of equilibrium, one of these centres becomes predominant, sexual aberration and perversions arise which, as we have remarked, are divided according to Magnan into four groups: 1st, Spinal; 2nd, Posterior Cerebral Spinal; 3rd, Anterior Cerebral Spinal; 4th, Anterior Cerebral.

Other authors, taking their ground on the importance of the olfactory sensations in sexual phenomena, have placed the sexual centre near the olfactory centre. All these theories, says Roux, are open to one common objection, that they place the starting-point of the phenomena in the surface, when it must be sought for in the periphery. It is no use to seek for one distinct centre regulating the sexual function, for *this centre does* not exist. The phenomena of sexuality are cortical reflexes, *we must simply seek for the point at which the centripetal portion of the reflex meets the corticality and the point at which the centrifugal portion issues from it.* Now the point of arrival is variable according to the causal sensation; the point of departure is also variable according to the external manifestation of love.

With regard to the nervous impression it is exceedingly probable that it ends in the central territory, at the circumrolandic circumvolutions, where Flechsig observed that the nerves of the general sensibility ended.

When it has reached the corticality, this nervous impression produces in the first place an internal phenomenon, a *conscious sensation*, and in the second place a series of *intercortical associations.*

Having laid this down in advance, Dr. Roux proceeds to show us what becomes of this conscious sensation.

2. **Conscious Sensation—Affective State.** "The *conscious sensation* is nothing else but that obscure disorder, the appearance of which we have described in the ignorant young girl.

"At this time, it is a *purely affective state*, of which the subject divines neither the cause nor the object, nor is it accompanied by any intellectual representation.

"At a later period, in consequence of other sensations with which this affective state is associated, it arouses intellectual representations; the subject knows the nature of the disorder which he feels.

"Ribot (¹) has pointed this out very well: 'At the time of puberty, when it follows its usual course, we know that it produces a profound change. Certain

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(¹) Ribot. *Psychologie des sentiments.*

conditions, known or unknown, act upon the organism and modify its state (1st period); transmitted into the consciousness, these organic conditions engender a particular affective tone (2nd period); this affective state when established arouses corresponding representations (3rd period). The representative element appears in the last place.' Even at this period, the affective state is still at the first plane. It is it which gives to love all its power, which imposes upon the consciousness corresponding intellectual representations, and renders the man incapable of thought and action, until he has thrown off this excitation by giving it satisfaction.

"Rafalowich (¹) has noted very well that in sexuality, besides the desire of pleasure itself, there is the seeking for its appeasement, 'the want to throw off and cast aside the sexual excitation.'

"It is the affective state which engenders that indefinable feeling of discomfort which results not only from prolonged continence, but sometimes merely from the absence of intimacy with women. It is the knowledge of the discomfort which causes Cyrano to say with feelings of gratitude:

'Grace à vous une robe a passé dans ma vie.'

"It is this discomfort which sometimes acquires all the force of an obsession, even when the genital organs are exhausted and do not demand any satisfaction.

"The scientist who allows himself to be carried away by an unworthy love does not seek for physical pleasure, an instant's delight, the vanity of which he knows. It is not that his genital organs demand to perform their office; too often he deplores that it is the opposite. It is the stronger impression which we have described, which impels him, possesses him, and renders him incapable of work. When he gives himself rein, it is not pleasure which he seeks, but the physical quiet which will follow.

But, in his case, there is more than one purely

(¹) Rafalowich. *Uranisme et Unisexualité.*

affective state; it is a mixture of representations, remembrances, images, etc. The nature of these representations depends on the sensations which, in the course of his life, have been associated with the sexual want. One will have the remembrance of physical pleasure, another will call up visual images, a third the remembrance of tactile or olfactory sensations, etc. It is therefore very interesting to study how these different sensations are associated with the sexual want, sensations which later on will become the *material of the representative sexual life.*"

3. Associations between the Sexual Want and the other Sensations.

A. Associations of the Sexual Want and Genital Sensations. The sensations which proceed from the genital organs are probably the first and, in any case, the most important which are associated with the sexual want. It was .owing to this association that Daphnis at length knew to what he was impelled by that delightful confusion which took possession of him in Chloe's presence. His teacher, Lycenion, after that, found the ground well prepared; her intervention besides would have been unnecessary, says Roux. In a modern novel, *Chair à Plaisir*, the author tells the story of an innocent young collegian, aged 16, and his simple little cousin. Happier than Daphnis, he did not need the lessons of an intermediary, and he did so well that he put the little cousin into the family way. This touching adventure is as follows: "I was 16 years old, when our of my uncles, a merchant at Toulouse, a widower and overwhelmed with business, entrusted his daughter to the care of my father who, having no occupation, would be able to attend to her education. At 15, she was the most delicious little creature that it is possible to imagine, a little madcap and only child; for my own part I was as yet too innocent to see any harm in the tokens of affection which we interchanged. You are smiling. What do you mean by it? It is quite true.

"How did this brotherly and sisterly affection come to assume another character? I cannot say. It came of itself. We frequently exchanged kisses, and yet not more often than before.... Often when we were sitting side, by side and hand in hand, the hot blood would rise to our cheeks and, covered with blushes, we dared not look at one another any longer. Then, with custom, we grew more responsive.... Although I was very innocent, I was not, need I say, altogether without ideas—at least theoretical ones. I was the professor,—a professor with no excessive knowledge—and although my pupil, whose ignorance did not, like mine, seek to hide itself, gave way to all my wishes and even aided me as far as lay in her power, we could not in spite of all our efforts arrive at a satisfactory result.

"'Daphnis and Chloe,' I said with a smile.

"'Exactly so,' he replied.

"He resumed: 'One morning we began again our unfruitful attempts. In despair, we doubted, she whether she was a woman, I, if I was a man. Having many a time heard my companions talking loudly of their exploits, the feeling of my inferiority filled me with rage. With our accord, a last attempt was made; the success surpassed our hopes.'

"'You succeeded but too well,' I interrupted.

"'Just so. You can easily imagine what followed.'

"'We were terrified: I thought I had wounded her dangerously and that I had crippled myself for the rest of my life. We debated whether we should have to tell it all to my parents, but as on both sides the symptoms quickly disappeared, we resolved to wait. In fact, as you may well suppose, my feeling of discomfort had no results: unfortunately, it was not the same with my cousin: her health seemed to have received a severe shock which we could not explain then: she had attacks of sickness, etc....'" (1)

Now, as the author says in his Prologue: "This, as

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(1) *Chair à Plaisir*. L. F. Meunier. Paris, Garnier Frères.

Montaigne says, is a book of truths. The author has invented nothing, he has merely told a tale. He has taken these stories from real life, adding nothing and taking nothing away, thinking that they were dramatic enough."

If the association of the sexual want and the genital sensations is not produced, the sexual instinct may be completely deviated. This is why, in all observations of sexual psycopathy we find, says Roux, an excessively precocious sexual want. The latter appearing before the genital organs, normal associations cannot be produced: abnormal associations are formed. In the same way, in the eunuch the sexual want exists, but it cannot be associated with absent associations. Later on, the sexual want is associated not only with canesthesic sensations, but also with voluptuous functional associations, with coition. Henceforward this want is no longer a purely affective condition; the representation of pleasure mingles with it.

"In the adult, the sexual want is almost always accompanied by the image of physical enjoyment, and reciprocally, the image of physical enjoyment comes to augment the sexual want. According to the predominance of one or the other, we shall have what we have called sexual *hunger and appetite*. These forms of genitality may exist in turn in the same individual, according to his physiological state or to circumstances. It is a common-place to observe that desire does not presuppose love. Some pretend that love does not necessarily presuppose desire, but this is very doubtful. The predominance of one or the other is variable according to the individual, and with regard to this two types may be distinguished; the one having hardly felt anything except the desire of genital satisfaction, the *sexual appetite;* the other subject to all the impulses of love and of *sexual hunger.*"

B. **Association of the Sexual Want and the Olfactory Sensations.** According to Roux, the association of the sexual want with the olfactory sensations is also of the first order of importance, especially when it is considered, not only in man alone, but in the animal series. It has been remarked for long that in the search for the female by the male, or reciprocally, the olfactory sensations often serve as guides. The development of certain glands with a musky secretion has no other cause. And if man himself is influenced by these secretions, a fact which feminine perfumery and coquetry know how to turn to the greatest account, it is that in man too the olfactory sensations have retained a great importance from the genital point of view.

Krafft-Ebing is as affirmative upon this point as Roux. "Among animals the influence of the olfactory perceptions is very evident. Althaus declares distinctly that the olfactory sense is of great importance for the reproduction of species. He shews that animals of different sex are attracted towards one another by the olfactory perception and that, at the period of rut, they exhale a penetrating odour from their gential parts. An experiment made by Schiff tends to support this assertion. Schiff has removed the olfactory nerves from young dogs when just born, and he has verified the fact that the same dogs, when grown up, were unable to distinguish a male from a female."

Mantegazza, *(Hygiene de l'Amour)*, made an trial in the inverse way. He has removed the eyes from rabbits and he has observed that this artificial defect has not prevented the accouplement of these animals. This experiment shows us what an importance the olfactory sense appears to have in the *vita sexualis* of animals.

It is also to be noted that certain animals have glands in their genital parts which deposit very strong-smelling matter.

Even as regards man, Althaus has brought to light the correlations which exist between the olfactory sense and the genesic sense. He quotes Cloquet, (*Osphrésiologie*, Paris, 1826). The latter calls attention to the excitant power of flowers; he recalls the instance of Richelieu who lived in an atmosphere impregnated with the strongest perfumes to stimulate his genital functions.

" Zippe, speaking of a case of kleptomania observed in an onanist, also brings forward these correlations, and he quotes Hildebrand as a witness who says in his *Physiologie populaire*: "It cannot be denied but that the olfactory sense has some connection with the sexual functions. The perfumes of flowers often cause sensations of pleasure and, if we recall that passage of the *Song of Songs*: " My hands dropped with myrrh, and my fingers with sweet-smelling myrrh, upon the handles of the lock, "—we shall see that King Solomon had already made this observation. In the East, perfumes are much liked on account of their influence on the genital parts, and the appartments of the Sultan's wives exhale the odour of all kinds of flowers.

Most, Professor at Rostock, relates the following fact: "I was told by a young pleasure-loving peasant that he had excited many chaste girls to pleasure and easily attained his end by passing, during the dance, his handkerchief under his armpits and then wiping his partner's face with it." The intimate perception of a person's perspiration may become the primary cause of a passionate love. As a proof of this, we will quote the case of Henri III. who on the occasion of the marriage of Marguerite de Valois with the King of Navarre, wiped his face with the chemise of Marie de Clèves which was steeped in sweat. Although Marie was engaged to the Prince de Condé, Henri suddenly conceived for her such a violent passion that he was unable to resist it and, it is an historical fact, that he rendered her very unhappy on that account. A similar fact is related of Henri IV. His passion for *la belle Gabrielle* sprang from the fact that, at a ball, he wiped his forehead with that lady's handkerchief.

" Professor Jaeger, (*Entdecke der Seele*), points to the same fact in his book, when he says that the sweat plays an important part in sexual affections and that it exercises a real seduction.

"A perusal of Ploss' work (*Das Weib*) shows that, in psychology, the perspiration from the body exercises a kind of attraction on the other sex.

"Regarding this, we must quote a custom which exists among native lovers in the Philippine Islands. When it happens in that country that two lovers are compelled to separate for a time, the man and woman exchange pieces of linen which they have used, to assure a mutual fidelity. These objects are carefully kept, covered with kisses and smelt. The predilection of certain gallants and certain sensual women for perfumes equally proves the connection which exists between the olfactory sense and the sexual sense.

"We must also quote a very remarkable case reported by Heschl; a case in which he has observed simultaneously the absence of the two olfactory protuberances and the atrophy of the genital parts. It has to do with a man, aged 45, whose testicles were the size of a bean and deprived of the deferent canals and whose larynx was of feminine dimensions. In his case there was a total absence of the olfactory nerves. The olfactory triangle and the groove at the lower base of the anterior lobes of the brain were also wanting. The holes in the lamina were scarce; instead of nerves there were prolongations of the *dura mater* which passed through these holes. On the pituitary membrane of the nose the same absence of nerves was observed. The consensus must also be noted which is clearly shown between the olfactory organ and the sexual organ in certain mental diseases. Olfactory hallucinations are very frequent in the psychoses of the two sexes which originate in masturbation, the same as in the psychoses of women caused by diseases of the genital parts or the phenomena of the menopause; on the other hand, in cases where there are no sexual causes, olfactory hallucinations are very rare.

"I am in doubt, however, whether in the case of normal individuals, the olfactory sensations play, as they do in animals, a great part in the excitation of the sexual centre.

"We have thought that we should now speak of the connection which exists between the olfactory sense and the sexual sense, the importance of this consensus for the comprehension of certain pathological cases being granted.

"Besides these physiological connections, there is an interesting fact to note, which is that a certain histological analogy exists between the nose and the genital organs, since both of them (and the nipple as well) contain an erectile tissue.

"J. N. Mackenzie, (*Journal of Medical Science*, 1884), has reported some curious clinical and physiological observations. He has observed, 1st, that in a certain number of women, whose nose was healthy, a congestion of the bulbous body of the nose was regularly produced at the period of menstruation, disappearing after menstruation; 2nd, the phenomenon of a substitory nasal menstruation which, later, has been often replaced by a uterine hemorrhage, but which, in certain cases, shews itself periodically at the period of menstruation, during all the duration of the sexual life; 3rd, phenomena of nasal irritation, such as sneezings, etc., at the moment of a sexual emotion; and 4th, the inverse of this phenomenon, that is to say accidental excitations of the genital system, following upon a disease of the nose.

"Mackenzie has also observed that among many women affected with diseases of the nose, these diseases grow worse during menstruation; he has observed, besides, that excesses *in Venere* may provoke an inflammation of the pituitary membrane or accentuate it if it exists already.

"He also recalls the fact that masturbators are usually affected with diseases of the nose and often suffer from abnormal olfactory impressions, as well as from rhinorrhages. According to Mackenzie's experience, there are diseases of the nose which resist all treatment as long as the genital diseases are not suppressed which exist in the patient at the same time and which, perhaps, are the cause of the nasal disease."

C. **Association of the Sexual Want and of the Visual Sensations.** If the visual sensations have made a later appearance in the animal series, they have rapidly acquired an importance of the first order. In man they have almost completely dispossessed the olfactory sensations, not only as regards the preservation of the individual, but also as regards the instinct of reproduction. This is a subject which hardly requires to be developed. It is the sight of the young man, distinguished among all, which causes the young girl's heart to beat, increases her emotion and makes her divine the nature of the confusion which possesses her. It is the sight of Daphnis at the bath, in the cave of the nymphs, which awakens the love of Chloe.

"Coming then with Chloe to the cave of the nymphs, he gave her his satchel and his cloak to keep and began to wash his hair and his body at the fountain's edge.

"His hair was as black as ebony, falling upon his sun-burnt neck; it seemed as though his hair reflected its colour on his skin. Chloe looked at him and thought how handsome Daphnis was; and as she had never hitherto thought him handsome, she imagined that it was the bath which gave him this beauty. She washed his back and his shoulders, and as she washed him, his skin seemed to her so fine and soft, that more than once, without his observing it, she touched herself, doubting which of the two possessed the more delicate body. As by that time it was late, the sun already being very low, they drove their beasts back to the stalls; and henceforward Chloe had no other idea than to see Daphnis bathing again. When they returned the next day to the pasture, Daphnis, sitting under the oak as usual, played his flute and watched his she-goats as they lay and seemed to take pleasure in the sweet melody. Chloe, seated near him, was watching her sheep feeding, but more frequently she had her eyes on Daphnis playing on his flute, and then too she thought him handsome; and thinking that it was the music which made him appear so, she took up the flute after him, to see if it made her handsome like him. At length, she wanted him to bathe again; and while he bathed she saw him quite naked, and when she saw him she could not help touching him; then in the evening as she returned home, she thought of Daphnis naked, and this thought was the beginning of love. And soon she cared for nothing and thought of nothing but Daphnis, and spoke of nothing but him. What she felt, she knew not how to express; a simple maid, brought up among the fields, and having never in her life even heard of love. Her soul was oppressed; in spite of herself, her eyes often filled with tears. She passed days without taking food, and nights without finding sleep; she laughed and then she wept; she fell asleep and awoke immediately with a start; she grew pale and at the same instant her cheeks burned with fire. The heifer when stung by the gad-fly is not so wildly agitated. From time to time she fell into a kind of reverie, and thus discoursed all to herself: 'I am ill and I know not what is my disease; I suffer, and I have no wound; I am in grief, and I have not lost one of my sheep; I am burning, though I sit under such a thick shade. How often the briars have scratched me, and I did not weep; how often the bees have stung me, and I was soon healed. It must be said then that what affects my heart this time is more piercing than all that. In truth, Daphnis is fair, but he is not the only one to be so; his cheeks are red, but so are the flowers; he sings, and so do the birds; and yet, when I have seen the flowers or heard the birds, I think no more of them afterwards. Ah! why am I not his flute, to touch his lips! why am I not his little kid that he might take me in his arms! Oh! wicked fountain that hast made him so fair, canst thou not make me fair also? Oh Nymphs, you leave me to die, me whom you have seen born and living among you! Who after me will make you garlands and nosegays, and who will care for my poor lambs? and of thee also, my pretty grass-hopper, whom I took such trouble to catch. Alas! what will it avail thee now to sing in the mid-day heat. Thy voice can no longer send me to sleep under the arches of these caves; Daphnis has reft me of sleep.' Thus spoke and sighed the sorrowful damsel, seeking what that love might be, whose fires she felt but whose name she could not find."

"It was therefore through the eyes that the love for Daphnis entered Chloe's heart. Later on, says Roux, it is almost always by the visual impressions that the sexual want is increased: it is upon them above all that the *choice* is based. The conception of beauty in man or in woman has for its almost exclusive foundation the visual sensations in their relation with sexuality. Were we to take away from man the sexual want and the visual sensations associated with it, half of the works of art would have no reason for their existence; a simple walk through any gallery of painting or sculpture is enough to convince us of this. In an adult man, the sexual want declares itself above all through representations of the visual order. This is the origin of a very great number of works of art. A fine picture has no other definitive signification than the gorgeous plumage of the humming-bird. Anyone would find it difficult at the present day to defend the absolute beautiful.

"No surprise ought to be felt at seeing sculpture and painting on an equal footing with modern literature celebrate enviously the beauty of the human body, and specially that of the woman. Without the most minute descriptions of the heroine and her most secret charms, the modern novel would have the fate of the tales of the chaste and pensive Berquin."

D. **Association of the Sexual Want and the Auditory Sensations.** "Although of much less importance in the case of man, the auditory sensations play nevertheless an important part in the sexual life. Among certain animals it is of great consequence. Who does not know the song of the Grasshoppers and Crickets. When we are walking some lovely evening across the fields, or perhaps by the side of a brook, hardly a moment passes without our hearing, in one place or another, a long, uniform, sweet and agreeable sound.... If we cautiously approach the spot whence the song proceeds, a Gryllo-talpa is seen at the entrance of a hole in the ground, apparently motionless. It is only when we look closer that we see the elytra of its wings make a rapid movement of friction, by which the sound is produced.... It is clear that this faculty for producing musical sounds can be of no utility to animals in the struggle for existence.... The formation of a musical apparatus may be explained in a simple manner by the emulation in the research for the females by the males. If we may suppose that the former find a certain pleasure in hearing the song of the male—and that is proved—we can find a perfect explanation of the origin of a musical apparatus. (Weissmann) (¹)."

"The same remarks apply entirely to the song of birds. 'Sexual selection offers therefore the possibility of explaining in a sufficient manner the development of song in insects and birds.' (Weissmann).

"As regards man's singing, the question is more discussed; Darwin assigns to it a similar origin, he believes that it is developed by sexual selection, and has only given birth to language in a secondary way. For J. J. Rousseau, Schweibe and Herbert Spencer on the contrary, language is the earliest, and music only made its appearance afterwards. Weissmann considers the musical sense as a complementary production of our auditory organism, without necessary relations with the sexual life.

"Without considering what takes place in man, without even appealing to comparative physiology, it is very difficult to refuse a part to the auditory associations. The mere tone of a feminine voice may, at certain moments, exasperate the human erethism. On the

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(¹) Weissmann, *La Musique chez les animaux et chez l'homme.*

other hand, everybody knows the disagreeable, painful impression produced by a harsh, cracked voice issuing from a pretty mouth. In the enumeration of the charms of his mistress, the poet never forgets the charm of her voice. The words of love have a caress independently of the sentiments expressed. Lastly, sexuality holds the principal part in music as it does in the other arts. In popular songs, in the songs of the troubadours, as well as in modern operas and even in religious music itself, it is love which will be found most frequently expressed. Go into a church, into a theatre or music-hall, you will find there love-songs, addressed to the sexual instinct, from its highest forms to its lowest manifestations."

Association of the Sexual Want and the Tactile Sensations. "The tactile sensations also give their note in this sensual concert. The stroking and pressure of the hand, the first kiss are the elements which maintain and raise to the paroxysm of the first passion. Later on, there are longer embraces, more ardent kisses, bolder and more skilful caresses, a more complete fusion of two beings in search for the infinite happiness by which the species is perpetuated and the immortality of the germinative plasma is preserved. Henceforth the sexual want necessarily awakens the remembrance of these sensations: reciprocally, one of them may suffice to augment the sexual want."

It is by the kiss which Chloe gives him, as a prize for his contest with Dorcon, that love enters into the heart of Daphnis.

"It was an innocent artless kiss: however it was enough to inflame a youthful heart.

"Dorcon, seeing himself vanquished, fled away into the wood to conceal his shame and displeasure, and afterwards sought for another way to be able to enjoy his amours. For Daphnis, it was not as if he had received from Chloe a kiss, but an envenomed sting. He became sad in a moment; he sighed, he shivered, his heart beat; he grew pale when he looked at Chloe, and then all at once a blush rose to his cheek. For the first time, then, he admired her fair hair, the sweetness of her eyes and the freshness of a tint whiter than milk cheese. It might be said that from this hour he began to see, and that hitherto he had been blind. He only took a taste of his food, and enough drink to moisten his lips. He was pensive and dumb, he who beforetime had chattered like a cricket; he remained sitting, motionless, he who had been accustomed to leap more than his goats. His flock was forgotten; his flute lay neglected on the ground; he bent his head like a flower which hangs downwards from its stalk; he burned and was dry like the grass in hot weather, having no more joy, no more chatter, save when he spoke to her. If he found himself alone at any time he went talking to himself: 'What has Chloe's kiss done to me? Her lips are more tender than the rose, her mouth sweeter than honeycomb, and her kiss is sharper than a bee's sting. I have often kissed my goats, I have kissed her lambs, and also the little calf which Dorcon gave her; but this kiss is quite another thing. My pulse beats and my heart throbs at it; my soul too languishes, and yet I desire the kiss over again. Oh, unhappy victory! strange malady, the name of which I do not know. Had Chloe tasted of some poison before she kissed me? But how then is she not dead? Oh! how the birds are singing, and my flute is mute. How the goats are leaping, and I am sitting still. How all the flowers are in bloom, and I make no posies or garlands! The violet and the lily of the valley are in flower, and Daphnis fades. Dorcon, at last, will be handsomer than I.' Thus did poor Daphnis rave, and such were the words he said, as he who for the first time has experienced the sparks of love."

G. **Association of the Sexual Want and the Gustatory Sensations.** "It is hardly requisite to say that in man the gustatory sensations play absolutely no part in the normal state. The first salutation exchanged by certain animals of different sexes might cause it to be believed that it is not the same with the whole animal series. But it is very difficult to say whether it is not merely a question of tactile sensations, of a mode of kissing. The same observation may be made with regard to certain cases, qualified as pathologistic, in man, and which are so common that it is enough to allude to them to include them all. In this order of ideas, we shall quote textually a passage from Mantegazza (¹), leaving to him the responsibility for his statements: "In the island of Ponapé (Western Carolines), they elongate artificially the nymphæ and the clitores of young girls in order to increase the pleasure, and the lovers seize these delicate organs with their teeth to excite them and elongate them gradually. Kubary says that some of them place in their wives' vulva pieces of fish which they lick. They do that especially when they wish to have a son by their favourite wife. She is so excited by this manœuvre that she allows her urine to escape; the husband then takes her and fecundates her.

"On this ground, man of the purest Aryan race and those of the lowest ethnical degree join hands in fraternal animality. If the fish placed in the vulva at Ponapé fills you with horror, I can tell you that an officer in Europe placed some quarters of orange in the vagina of his mistress before eating them, and that many like to receive upon their belly the final products of their wife's digestion.

"In the madness of lust, men have gone so far as to eat congealed sperm (the Priapolithes, according to Borel), and to eat bread kneaded upon their wife's bottom." JOANNY ROUX.

We are sorry to hold an opinion upon this contrary to that of the learned physiologist. In the first place, among animals the taste in a powerful excitant of the sexual want. What does a dog do when he meets a bitch on heat? He scents her at a distance, rushes

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(¹) Mantegazza, *L'Amour dans l'Humanité.*

after her, smells her vulva and immediately licks the vestibule with the tip of his tongue. In a word, he *gamahuches* just like a passionate man. But as this special taste infallibly produces in the dog a violent venereal orgasm, without waiting for the trifles at the door-way, he immediately tries to perform coition.

How many men are like the dog on this point? I knew one who placed bananas in the vulva of a Tahitian. It is evident that the habit of eating sperm, or having a turd deposited upon the belly, is a pathological case which is dependent upon sexual psychopathy, and we refer the reader to our Third Volume of the Ethnology of the Genital Sense, where we have studied these depravations in detail.

But just as in our study on Onanism we have put the question whether there are not more men who have masturbated themselves as children than those who have remained pure from this offence, so we might ask if the number of men who have passed their tongue, in a fit of erotic passion, over the vagina of their mistress, if it is not equal to the number of those who have abstained, constitutes at least a large minority.

Without going as far as that how many men are there who have not sucked the breast of their mistress?

"Without the taste, says Lamettrie, this other kind of touch, more naked, more intimate, without the same easy communion of the nerves of the palate, our tongues, vainly voluptuous, would wriggle without lewdness in all the bare portions of the skin."

LAMETTRIE, *De la Volupté.*

Results of the Associations established between the Organic Sexual Want and the various Physical Sensations. These associations result "some from the anatomical structure, transmitted hereditarily. Certain neurones form groups and systems, across which the influx finds less resistance and is propagated more easily. These are specific associations resulting from numerous ancestral experiences.

"Others, on the contrary, are variable with each individual; they result from personal experiences. A fortuitous association, often repeated, finds at each fresh experience a freer way and a less resistance; it may become as well-established as the specific hereditary associations. Transmitted to the descendants, it may itself become later on a specific association. Thus are explained the innumerable variations in love of peoples and races. These variations are called pathological when they deviate too far from the type most favourable to the species in a general way.

"What results from this association of the sexual want with the sensations of different orders which we have just studied? When two sensations, just as two ideas, are associated a great number of times, have existed simultaneously in the consciousness and have augmented one another reciprocally, one of them cannot appear without the other arising in a parallel line. Moreover, after that the sexual want acquires an intensity sufficiently great to appear in the consciousness, it causes a whole throng of images to arise there. Inversely, if we perceive a sensation which has previously been associated with the sexual want, the latter is immediately reinforced and makes its appearance. A favourite odour, the sight of a profile which we admire, of a figure which we think elegant, of a detail of the toilette, of a shade of the hair, of something in the walk; a tuneful caressing voice; a pressure of the hand or . . . . of the foot, all these are sensations which in an instant may excite and raise to a paroxysm the desire of possession.

"All this together constitutes physical love, the only kind which probably exists in animals, and the least noble, but probably the most frequent which occurs in the case of man. When it has arrived at this degree, the sexual want is on the point of appearing externally, the act is imminent. The latter commences with choice, it ends in accouplement." JOANNY ROUX.

Influence of the Senses upon Pleasure, according to Meusnier de Querlon. The preceding belongs to the domain of modern medical science. It is attractive to see the analogous question treated in a very different fashion, but under a literary and philosophical form by an author of the 18th century, the philosophic journalist Meusnier de Querlon. In his story, *Les Dortoirs de Lacédémon*, he describes an interview between Voluptuousness and Pleasure, between Lais the Courtesan and Aristippus the Philosopher. After studying the influence of the different senses on pleasure in general Meusnier de Querlon proceeds to study voluptuousness, or the pleasure of love.

"*Aristippus*—But, as it is a question of philosophy, I maintain that the pleasure of love, recalled like that of taste to the simplicity of Nature, is hardly more delicate or hardly more keen, and finally that it only becomes so affecting because it is the one which most of all impresses itself on the faculties of the soul. You know that the imagination has all the properties of the senses, that it reproduces the sensations to us and recalls them to mind in a still keener shape than they naturally possess.

"Now voluptuousness, which is in question, is far more closely connected with the imagination than with the bodily organs: therefore all the senses appear to be of service to it. Consider with me the whole extent of this universal voluptuousness of Plato. Look at lovers when they are inflamed: the charm begins with the eyes: they are skilful in discovering in the object of their mutual passion perfections and graces which escape all other eyes. At the sight of one another, all their senses are excited and satisfied at the same time, or rather their whole soul is in their senses; love traverses and fills every one of them, it renders them more subtle and delicate. Their glances are darts of flame which kindle them reciprocally, their eyes swim in a tender intoxication which allows them only to see themselves. There is no note of harmony sweeter to the ear than the voice which issues from a beloved mouth; it goes straight to the heart and penetrates it. Shall I speak of the smell? What part does it not have in the delirium of the senses? All these voluptuous circumstances unite in the presence of the object that we love.

"What happiness it is for lovers to find themselves together! They kiss before they touch one another; all their warmth is communicated and pierces through the thickest veil. At the slightest approach they are on fire. Happy is he who can hold the hand of his mistress and can feel her foot to press it with his. Love, at this moment, makes them taste the pleasures which are past, the pleasures which are present and those which are yet to come. But what charm, what felicity when they are in one another's arms, when all their senses are confused and drowned in a torrent of delight, and they feel a flowing of their soul in proportion as pleasure is poured out and distilled from their hearts! Such are the sweetnesses of love, the inexpressible sweetnesses which cannot be bought; the poor feel them as well as the rich; love renders all men equal and, while under gilded ceilings it charms away the cares of kings, under a rustic roof it makes the rude toil of the labourer enchanting.

"*Lais.* There is a fine Hymn to Love: and yet had I held the brush in depicting these pleasures, I should not have forgotten the kisses seasoned with the nectar of the gods, nor those tender expressions stifled as soon as they are given birth to by pleasure, nor those delightful instants when the lovers as it were make an exchange of their souls, which seem to stray upon their lips and to be breathed forth in their burning sighs, nor those moments of intoxication when each one gives as much pleasure as he receives, nor those gentle languors, nor those swoons." Meusnier de Querlon. *Les Dortoirs de Lacédémon.* Paris, E. Flammarion.

Influence of the Senses on Love in Modern Literature. Frédéric Lolier in his work, *Les Immoraux*, (*Etudes physiologiques*), has analyzed with perfect fairness the works of modern authors upon Love, and remarks that the romantic literature of the present day is but one long cry of desire. We borrow a few pages from his work which the reader will find it interesting to compare with that of Meusnier de Querlon.

"If the sight of an adorable creature is sufficient to tempt a man, how much more exciting must this impression by the subtle envelopment of *her perfume.*

"Each of our senses, either as an indirect anxiliary or as an active agent, cooperates differently and on its own account in the fusion of love.

"The sight, the messenger of beauty, awakes the revelation, produces the thunder-bolt and gives birth to the charm.

"The hearing, a secret entrance to the heart, a door always open to tender insinuations, a key-board always sensible to the soft cadences of the voice, induces languor and desire.

"The taste, the special and local manifestation of the touch, finds its rare enjoyment in the perverse refinement of certain caresses and the careful prolongation of certain kisses.

"The smell, the magnetic monitor of the imagination, exhilarates the nerves, titillates the brain, provokes the delicate fibres, tickles and stimulates the voluptuous powers.

"The bold touch promises conquest and the spasm.

"After the thrill of the contact, the keenest impression is that which results from the phenomenon of smell. No sensitive assimilation is effected so promptly as by the medium of this principle, bringing the living molecules and the living papillæ into immediate communication.

"Who does not know the part, the universal part played by odours, among the causes and effects of the union of the sexes? Is it not for this end that Nature has inserted musk, civet and castoreum in secret laboratories? Long before the solitary animal has perceived the other creature after which it neighs, or yelps, or bellows, or brays with impatience, the wings of the wind have borne to its nostrils the smell which informs it and fills it with pleasure. In the human species, where the artifices of the toilette, and perfumery, lotions, pomades and essences, highten still more the emanation from the person, the most delicate members do not escape this sensorial action.

"According to the evidence of certain learned noses which have had much practice, and for which the least and most subtle particles have their sensuality and their value, the perfume of the woman is of a complex nature.

"Subject to the variations of the three great phases of her existence: the time of puberty, the time of marriage and the time of the menopause, it depends equally upon a number of chemico-physiological modifications. Moral influences, such as joy, grief, anger, diversify, as it appears, these aromal qualities. It is not the same in calm and in storm, at down and at evening twilight, or at night, behind the curtains. One, because she is young, secretes an essence of verbena. Another, because she is no longer young, recalls the odour of dried rose-leaves and faded lime-flowers. This fair creature gives forth a savour of ambergris. This dark one disseminates particles of musk. Others smell of civet, violets, angelica, vanilla and heliotrope, or of ebony, or chloroform and sometimes, 'tis said, of castor-oil.

"No lover, no husband can resist the temptation and caresses of a woman who gives out in privacy a natural, intoxicating and sweet smell.

"Affinities exist between the sexes, just as correspondences of temperaments. What do I say? For certain men, the essential thing in a woman is not beauty, wit or distinction, but smell—the smell intoxicates and makes them giddy.

"It is not surprising therefore that authors, anxious to lose nothing of the slightest physiological sensations, have carefully analyzed the peculiar action of the epidermic effluvia upon nervously impressionable organisms.

"It was a delight to poets, to the tender romancers of olden times, to confound together woman and flowers, in their gallant medleys; it was a pleasure to them to identify a sweet breath with the strange perfume of dying roses worn on a woman's breast. But they hardly went beyond that idea. They did not stop to decompose too closely the heterogeneous evaporations of the living flower and the flower from the garden. They prudently glided over a distinction so . . . . dangerous. Perhaps they feared disillusion in passing through the alambic the chemical realities of which we speak. They would have dreaded to encounter unpleasant mixtures, like those of powerful oils intended to combat and correct the secret distillations of Nature. The *odor di femina* was no mystery to their refinements. They did not mistake its vague and troublesome influence. Only it did not occur to them to celebrate in verse and in prose that indistinct vapour of the beloved flesh which is so pleasing to their successors, and still less that irritating flavour which arouses all that there is of the wild beast in our appetites of pleasure.

"Oh! now we do not shrink from either the thing or the expression. The fugitive aroma often floats around us.

"It would be curious to follow philosophically the ascendancy which the olfactory obsession is able to have over the direction of a modern writer's thoughts.

"If he delighted in details, his object is to search eagerly on his way, everywhere and in all circumstances where it could arise, for the physical provocation through the subtle or vivacious carnal emanation. At a ball, he would certainly be struck with the variety of the flowers, the charm of the dresses and the play of lights and faces. He would speak of them; but he would feel and he would prefer to stay and describe the vague sensation of an atmosphere in which, under the heat of the lamps, corpuscles of femininity were dispersed abroad. When he meets the woman he is distined, as he conceives, to love, he will be struck all at once not by the glance of her eyes, not by the sound of her voice, but by another kind of powerful magnetism: by her warm breath, by the aroma of youth and life which rise from a lovely bosom, by the evaporation of 'an odour of a fair girl who has valsed for a long while.'

"The idea of her panting breasts and heaving sides brings incidentally to his mind the corresponding and metaphorical idea of the undulating motion of the sea, and he will dwell complacently upon the picture. Reminiscenses of forms and scents will come to him; he will prolong his reverie; he will make a pause and stay there, too happy to breathe that which he believes to be 'the penetrating odour of the sea as it breaks against the rocks strewn with shells and sea-weed.' (1)

"Imagine a bouquet of exotic flowers which have expanded under a torrid sun and have scattered afar their perfumed dust, intoxicating and infatuating, and yet you will not attain the impression of fever and agitation and trembling produced upon these sensitive beings by the preconceived perfume of a pretty body waking up *after a night full of emotions and mysteries.*

"Skilful virtuosos! They dissolve, harmonize, distinguish, decompose at their will the personal essence and the sweet or false perfumes with which women impregnate themselves under their clothes, and which become volatilized and mingle with their perspiration.... It is a fashionable woman's bedroom: upon the sophas are scattered velvets, satins, laces; upon the cushions is displayed a waving mass of glossy petticoats and the air is suffused with the scent of sachets. 'The woman's odour prevails here,' they will cry.... Besides, there is the rustle of petticoats, the exasperated movement which suddenly dislodges iris, or new-mown hay, hidden in the inmost recesses of her garments. They will quickly introduce, under cover of its appropriateness, a very ticklish, very naughty phrase, leaving it to be understood besides that they are the cleverest persons in the world to discern, beneath the cambric and the silk, the perfume *sui generis* of superadded scents.

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(1) René Maizeroy. *L'Adorée.*

"This knowledge of feminine intimacies has reached an alarming height in contemporary writers. It occupies a great portion of that which was formerly held by the knowledge of hearts and souls.

"To see the woman we adore, to breathe the light essence contained by her clothes, is a great deal, but it is not much if we cannot, besides, have the happiness of kissing her voluptuously.

"Paradise lies on the lips of the woman we love, and she is ours when our lips are in hers.

"It is impossible to enumerate all the flights of fancy inspired in poets by the delights of the kiss,—the sensation of which is more complete than the last stage of intoxication, because it is without disenchantement, because it is prolouged to infinity without interruption, because there is nothing to limit the number of times it can be repeated. This impression of an exquisite confusion has been sung and celebrated in many ways: to compare them together would be a delightful task for a devotee of the fair sex.

"In ages past, there were delightful terms in which to describe the dainty, savoury caress, the graceful kiss, the *suavium* of the Latins, the sucking which would not cease, or the pigeon's wriggle. *Accoler*, *baiser*, *langueter*, are the happy expressions in French. And it is the delicate shade which distinguishes these sweet peckings from our tumultuous kisses, the fury of which is exaggerated into suffering, The poets expressed a pleasure, they gave no idea of a breaking. The kisses were as good, but more simple; as intoxicating, but perhaps less skilful. They were more healthy, at least, even when they were accompanied by that loud clacking of the lips so much liked by the libertines of the Regency.

"Certainly, we know the price, in life, of those moist, silent kisses, which leave us to perish ineffably in our soul and our senses. But in our books there returns to us the burning of lips which fall on the skin like drops of fire, the sharp pressure of the teeth leaves its mark on the adored one's shoulder, the feverish, exasperated caress which devours and is convulsed. The cords of love are stretched to breaking point. These delights absorb all the heart and all the blood. Formerly, they kissed more and bit less. They died away in a similar manner in their sweetheart's arms; only they recovered quicker and did not cry so loudly. I always speak literally. On the other hand, we carry to a degree with which our ancestors were unacquainted the idea of physiological self-restraint. (It is true that it is abused.) We are past masters in the art of following, from one extremity of the human body to the other, the circulation of the kiss.

"Consider these lovers; *she*, with her head laid back and her figure thrown forward, *he*, looking at her in mingled confusion and expectation, and seeking for the moist rose-bud of her mouth to drink deeply there in. The nervous papillæ of their lips are joined together. As soon as the vibration is imparted, it starts from these centres of sensibility, it leaps onwards, it unites gradually with the nerves which carry it from the mouth to the heart and to the inmost parts of the organism. The little labial glands, their cuticle is as fine as gauze and indescribably ticklish, their velvety nipples are electrified; the current reverberates through the whole being and in both beings; the orgasm is complete.

"This is the modern kiss from which we proceed, in the erotic matter, to the notation of the crisis which follows: the demand of carnal confrication: *Tentigo libidinosa!*"

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CHAPTER XII.

PHYSICAL LOVE IN ANIMALS.

Physical Love.—Choice.—Modus faciendi of the Accouplement in Thalamic Animals.—Periodicity of the Sexual Instinct or of Rut.—General Rules of Rut in Animals.

WE know, from Letourneau, the general law of Reproduction in the entire organic world. We shall not give a complete account of the manifestations of the sexual instinct in the entire series, but we nevertheless think it useful to take physical love at its point of departure in the lowest scale of the animal world.

Joanny Roux has shown us that the sexual act commences with *choice* and terminates by *accouplement.*

Let us pursue this datum and begin with studying *choice* in Love.

Choice.

1. "*Choice in Infusoria.* In order to thoroughly understand the mechanism and signification of *choice* in love, we must first study it at its lowest degree in the animal series. 'A superior instinct seems to dominate these little beings,' we have said a little while ago, with Babiani, in speaking of Infusoria; 'they seek and follow one another, go from one to another, feeling by means of their hairs, agglutinate for some seconds in the attitude of sexual intercourse, and then

they part only to meet again soon. These singular games, by which these animalculæ seem to provoke one another mutually to accouplement, often last for several days before the latter becomes definitive.' Infusoria, to sum up, seek for the partner which suits them the best, they *make a choice;* the mechanism of this choice is now perfectly elucidated. That our thought may be perfectly understood, may we be allowed to recall analogous phenomena, although of another order.

"Stahl takes a plasmodium, the æthalum septicum, he places it on the side of a moist glass, then pours into the glass an infusion of oak-bark: the vegetable cellule makes its way towards it. If, on the other hand, it is partly immersed in a solution of glucose, it rapidly withdraws. What has happened?

"The infusion of oak-bark has in the first case, affected the plasmodium at a distance, by its smell, vapour, etc. This impression has produced amboidal movements in the vegetable cellule, just as the percussion of the rotulian tendon in man causes the sudden extension of the leg. These amboidal movements result in drawing the plasmodium to the infusion. In the second case, on the contrary, the amboidal movements, produced by an absolutely similar mechanism, result in the removal of the cellule. Why is there this difference of reaction? The reason is that the oak-bark is favourable and the solution of glucose unfavourable to the life of the plasmodium. We then say that the latter is endowed with a positive chemiotropism for the oak-bark, and a negative one for the solution of glucose. The *aethalum septicum*, has inherited from its ancestors the faculty of reacting in the best way for its interests. This faculty, in fact, constitutes for the individual a superiority in the struggle for existence, since it enables it to seek for what is favorable and avoid what is harmful. The individuals which have possessed it have been therefore better preserved, have been able to reproduce themselves under better conditions and have transmitted their qualities to their descendants. This is a strict application of the laws of evolution. Where it seemed to have an *intelligent choice*, a free determination, there were nothing but physico-chemical actions subject to a strict determinism.

"Let us now return to the accouplement of Infusoria: they affect one another mutually at a distance or by contact; from these impressions result movements which cause them to approach or to withdraw; there is, according to the individuals which meet, a positive or a negative tropism. When the positive attraction has attained a sufficient degree, accouplement takes place. But why is the tropism negative between certain individuals, and positive between others? It must be admitted that the attraction is positive when the two individuals which meet are capable of a *fecund* accouplement. In fact, when it is so, the individuals reproduce themselves under the best conditions and transmit their qualities to their descendants: the latter, equally, will only have a positive tropism for individuals with which they will be capable of having a fecund accouplement. On the contrary, Infusoria which are capable of being attracted to Infusoria unsuitable for a fecund accouplement, will not be reproduced and their race will perish. Thus a physico-chemical property is developed among Infusoria giving birth to phenomena which, upon superficial examination, seem to suppose an *intelligent and free* choice.

2. "*Choice in the Gryllo-talpa.* Let us ascend several degrees in the animal series. On a fine summer evening, the female Gryllo-talpa has come forth from its den; its auditory organ is agreeably struck by the music which the surroundings males are playing on their elytra. After a minute she goes towards one of them whom she seems to *choose.* Why towards that one rather than towards another? By virtue of the associations we have described, the want of the male is excited in her by the musical sounds. The latter come from two different directions; unless they are absolutely alike, the excitation produced by some is

stronger than that produced by others; the attention is directed to the former, it constitutes a first approach, a tendency, a movement in that direction. From this fact the excitation grows, the attention and tendency towards that side increases. The final result is the coming together and accouplement."

Modus Faciendi of the Accouplement in Thalamic Animals. We shall borrow from Tillier the description of the *modus faciendi* of the accouplement in *thalamic* animals.

"The whole category of creatures which search for one another at the time of fecundation, or thalamic animals, and in which, consequently, the manifestations of the sexual instinct are more or less easily observable, is composed, as we are aware, of three distinct groups.

"1st. The group of hermaphrodite species comprising a large number of calcuteræ, some inferior crustaceans and many molluses.

"2nd. The group of species of separate sexes, but not accoupling in the strict sense of the word, comprising some calcuteræ, the greater part, if not all, of the echinoderms and nearly all the fishes.

"3rd. The group of species of separate sexes and with real accouplement, comprising all other sexuated animals.

"In order to avoid a certain confusion, we shall in the first place demonstrate that the sexual instinct in the two first groups is identical in essence with the sexual instinct of the species which accouple.

"All the thalamic hermaphrodites, whatever may be their mode of fecundation, are animals with slow and difficult movements; some of them even live parasitically upon other species. As far as we able to know, they are rarely very isolated, and they are generally met with in rather numerous troops or groups of individuals, which, without forming what may be compared to an animal society or family, are united in greater or less numbers where they find the most favourable conditions for their existence. The displacements which they have to execute at the time of the approach necessary for fecundation, are therefore as a matter of fact inconsiderable, although relatively to the imperfection of their functions of relation, these displacements may have a certain importance.

"At the period of reproduction, these hermaphrodites, which have lived hitherto without appearing to disturb themselves about one another, become agitated and seek for one another actively. For those which accouple reciprocally, owing to a certain number of observations, it is certain that the search is reciprocal also, which besides may naturally be concluded from the fact that every individual must have exactly the same sexual instinct as every other individual of the same species, since all have the two sexes and fill at the same time the part of male and female.

"For the hermaphrodites with simple acouplement, we are ignorant if certain conditions of age, size, or position do not intervene at the moment of the embrace to decide the sexual part, and if, in the duration of its life, in case it reproduces itself several times, an androgyne of this category changes the sexual part or always retains the same.

"We also are ignorant, or at least we only know imperfectly, what passes when, in the course of the search of the creatures for one another, three individuals happen to meet; whether the accouplement is simple or reciprocal and not in a chain.

"But it must be admitted, although no sexual struggle appears to exist, that, of these three hermaphrodites, the one which does not succeed in accoupling will in some degree have been prevented by one of the others.

"On the other hand, as Agassiz has remarked, whoever has studied the amours of snails, would have no doubt as to the seduction employed in the movements and behaviour which precede the double embrace of these androgynes.

"Lastly, it is easy to see that these creatures, which at ordinary times try to escape and conceal themselves from their enemies, seem, when they are accoupled, to have lost the instinct of individual preservation, and remain closely united even when they are seized or disturbed by anyone.

"Now, as we shall see further on, in studying their habits, we observe precisely the same facts among animals of separate sexes which accouple. At the period of reproduction, the two sexes are agitated and seek for one another; the accouplement is preceded by a longer or shorter period of courtship during which certain movements may be observed resembling caresses; if two males meet near a female, they contend together for her possession, and during the union of the two sexes all the other vital instincts seem to disappear before the sexual instinct.

"Without therefore any prejudice regarding the impressions which may be felt by two hermaphrodites trying to fecundate or to be fecundated, we may admit that these impressions are, in essence, identical with those experienced by animals of separate sexes which accouple. Only, we must believe that each hermaphrodite possesses at the same time the sexual instinct of the male and that of the female, so that the considerable differences which exist, as we have seen, between the instincts of the two sexes, cannot be met with in hermaphrodites.

"As the sexual functions are not specialized in two different unities, it is also possible that the instinct which presides over the exercise of these functions may be less perfect; but in any case it is only a question of a simple difference of quantity, and, as far as we are able to know, it must be admitted from the point of view of the sexual instinct, that hermaphrodites do not differ essentially from separated animals.

"An analogous course of reasoning enables us to see that the species with separate sexes, but among which the male merely scatters the fecundating liquid on the eggs which have been previously laid by the female, and without uniting with her, do not differ at all, from the point of view of the instinct, from the species which accouple.

"Among these species, which are all aquatic, the search is in fact ardent and active; fecundation, in all the known cases, always takes place in the presence of the females; the males fight furiously for the possession, not of the females, but of the eggs to fecundate, the sexual instinct at the time of fecundation prevailing over all the other instincts; the animals which act under its impulsion appear to lose all idea of danger, and lastly, the individuals, at the time of reproduction, sometimes collect in large troops and perform considerable migrations. These again are facts precisely similar to those which we may observe in species which accouple.

"To sum up, there is nothing therefore to authorize us to establish, from the sexual point of view, a difference of principle between the hermaphrodites, the species of separated sexes which do not accouple, and the species of separated sexes which accouple. The reunion of the sexes on a single individual, the separation upon two distinct individuals, fecundation without union and fecundation by accouplement, appear to depend solely on the morphological development of the organism, and, to employ scientifically inexact expressions, which however, will enable our thoughts to be better understood, we shall say that Nature appears to have acted as if fecundation were the important thing for her, the manner in which this fecundation is effected remaining a subsidiary and indifferent question.

"If the preceding considerations appear sufficient for us to be able to admit the identity of the sexual instinct in all thalamic animals, whatever be their mode of fecundation, what remains for us to say with regard to the species which accouple will therefore be true upon the whole, for all creatures which seek one another for the purpose of fecundation, with this restriction, however, that the differences which we shall find in the manifestations of the instinct in the male and in the female, cannot naturally exist when hermaphrodites are in question.

"These differences consist essentially in the male being, as a rule, active and ardent in the research which he makes for the female, while the latter remains rather passive and does not yield to the desire of the male until a more or less lengthy resistance, always appearing to select among the males the one that pleases most.

"It is sufficient to have observed, if only once, the the behaviour of animals at the period of rut, to have seen with what activity the male seeks for the female, with what ardour he endeavours to make himself her sole master, how at this moment the sexual instinct seems to dominate in him all the other instincts, and to have observed at the same time the more reserved behaviour of the female, to have seen her exercising her choice among several males, to form an exact idea of the differences of the instinct in the two sexes.

"Many similar facts will serve to prove that this ardour is greater in the male sex.

"Very frequently among domestic animals, and sometimes among certain wild animals, the desire for accouplement is so keen in the male, that he attempts to destroy the produce of fecundation, in order that the female may be brought to accept it again: almost without exception, the male seeks for and accepts any female whatever, while numerous facts prove that the female may refuse a given male and exercise a choice among those that present themselves to her: we never, or hardly ever, see that the courtship, the ultimate result of which is to retard the accouplement, is paid to a male by the female, but always on the contrary to the female by the male: that polyandry is extremely rare among the zoological series; polygamy is on the contrary extremely wide-spread: in certain species females have frequently been found suffocated under the embraces of several males: lastly, when vicious deviations of the sexual instinct exist, they are almost always to be observed in the male.

"The greater ardour of the male, the relative passiveness of the female are therefore biological facts entirely evident and upon which there is no need to insist.

"Though direct observations, easily made at any moment, do not permit us to judge with a thorough knowledge the cause of the differences of instinct in the male and the female, a whole order of facts exists, into the detail of which we shall proceed to enter, (for we shall often require to return to them), and which are connected with these differences: we refer to secondary sexual characteristics.

"Almost always the males differ from the females of their species by particular characteristics which, although connected with generation and often able to have an important part, nevertheless are not in direct relation with the sexual organs properly so called. From the existence of these characteristics in the male, and from their absence in the female, there results a sexual dimorphism slightly marked in certain cases, but formerly very considerable.

"All the cases of dimorphism enter into the following category:

"1st. When the female leads a more or less sedentary life, the male alone possesses the usual organs of locomotion, or these organs are more developed in him than in the female.

"2nd. There are found in the male only peculiar organs, the mode of action of which it is difficult to understand, but which certainly serve to seek for and to find the female at the favourable moment for the union of the sexes.

"3rd. The male often possesses, to the exclusion of the female, spines, hooks, or suckers, which enable him to hold the female at the time of accouplement.

"4th. The male differs from the female in size, a greater vigour, the existence of arms specially adapted for the sexual struggle with other males, brilliant colours, a melodious voice, various ornaments sometimes of a strange kind, a characteristic odour, and the faculty of emitting peculiar sounds or noises, or again of executing extraordinary movements.

"If we enquire to what all these secondary sexual characteristics correspond from the point of view of reproduction, we see that they are connected with differences of sexual instinct of the same kind as those we have established by direct observation of the habits of animals. In fact, if the organs of locomotion, peculiar organs intended for the research of the sexes, the fixing hooks for accouplement and the sexual ornaments exist in the male alone, it is because the latter plays the active part in all the acts relating to fecundation.

"It is easily understood besides, by what we have said in the preceding chapter of the origin of the sexual instinct, how these distinct aptitudes of the male and the female may have been acquired. The ovules being nearly always larger and more difficult to be transported than the male fecundating substance, it is natural that fecundation should occur, generally speaking, in the interior of the body of the individual-mother, when sexuated animals led sedentary or motionless lives. When at a later period active life took the place of sedentary life, that this transformation might be produced in hermaphrodites or in forms with separated sexes, the free and active descendants of the fixed species were naturally obliged to retain their acquired habits, the more surely so as these habits were more favourable to the life of the species, and, consequently, more strongly hereditary. The transport by the male of the fecundating element for contact with the female element has therefore become a very general law, at the same time as the female was organized more specially for watching over and developing the produce.

"As for the reserve which the female appears to show, by withdrawing herself for a longer or shorter period from the embraces of the male, a reserve which is general enough for it to be said that the courtship which animals pay one another, is an affair of long breath (¹), it is natural to think that it has for its object and result the rendering the male more ardent. The excitation produced by a delay in the accouplement

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(¹) Darwin.

perhaps increases also, in a certain measure, the power of the secretion of the glands, thus rendering the chances of fecundation more numerous. We shall however, have to return to this subject. The male, being often fit at any time for reproduction, or being able to be so for a relatively long time, may have need for a greater excitation than the female, whose rut takes place at fixed and better determined periods. Some facts, such as the drawing near of the periods of rut when there is cohabitation of the two sexes, and the courtship which hermaphrodites pay for crossed accouplement, tend to justify this way of looking at it. In any case, it is evident that acquired sexual aptitudes, whatever they may be, are always strongly hereditary, and these considerations make us understand how it could happen that reproductory systems, their acessories, and the instincts relating to the genital functions vary so considerably according to species.

"We see that great advantages may have resulted, for the perfection of the sexual instinct, from the specialization, if it may be so expressed, of this instinct in the two sexes; for, in proportion as the female was better organized for the preservation of the fecundated products, and as the maternal instinct, such marvellous instances of which we see before our eyes, became more complete, the male, whose principal office was confined to the search for, and the possession of the female, was himself better organized for his own functions.

"If, however, in the course of their evolution, the instinct may have become very different in the male and in the female, it does not follow that these instincts are, as a rule, absolutely distinct one from the other. Just as the female does not remain absolutely inactive when the two sexes are seeking one another, so the male is not completely unconcerned in the preservation of the young. Very often, when the organization of the species renders this cooperation useful, he comes to the female's assistance. There exists therefore between the instincts a kind of dimorphism analogous to sexual dimorphism properly so called, and, like the morphological characteristics, the instinctive characteristics acquired by a sex may be transmitted, in a more or less pronounced degree, to the other sex." (L. Tillier. *loc. cit.*)

The Periodicity of the Sexual Instinct or Rut. Letourneau, in his *Evolution de la Morale*, says that hereditary instincts and inclinations originate through a habit which causes a sufficient repetition of the same acts in the nervous cellules. The genesic instinct, according to him, has no other origin: "During the long phases of their evolution, animal species at first reproduced themselves unconsciously and by very simple processes which we are still able to observe in certain zoophytes; then these animal outlines were perfected, differentiated, acquired special organs, and shared in the biological work; the play of life has echoed since then in the nervous centres; impressions and desires have been awakened, the energy of which corresponds strictly to the importance of the functions; now, there is no more primordial function than that of generation, since upon it depends the very duration of the species. Therefore, in some animals, the want to reproduce, the *rut*, bursts out like a kind of madness. Small or great, the psychical faculties are then in a state of surexcitation and exceed their ordinary level, but all tend to one supreme object: the care of generation. At this time, the wild and unsociable species no longer endure solitude; males and females seek for one another; sometimes they are even seen forming groups and small provisional societies which are dissolved after pairing.

"Each period of rut is for animals a kind of puberty. The coat, the plumage, or the scales often then become endowed with rich and transitory tints. Sometimes special epidermic productions appear in the male, serving either as temporary weapons with which to combat his rivals, or as ornaments to captivate the female. The sexual union is accomplished with absolute frenzy in certain species. Thus Dr. Gunther has several times found female toads suffocated by the embraces of the male. Spallanzani has been able, without any result and without distracting them for an instant from their occupation, to amputate the thighs of frogs and toads during their accouplement.

"In the animal class which principally interests us, that of the mammifers, the rut produces analogous but attenuated phenomena. Now, here we are well aware that the erotic fury is closely connected with congestive phenomena seated in the generatory glands which become tumefied in the male and in the female, and produce, in the latter, a veritable laying of eggs. Let us recall the fact, *en passant*, that in his quality as a mammifer, man is subject to the common law, that feminine menstruation is absolutely identical with the inmost phenomena of the rut in the females of mammifers, and corresponds also to an ovarian congestion, swelling, and rupture of one of the numerous follicles of Graf, and finally to an ovular deposit. I have no need to dwell on these facts, but I have had to recall them *en passant*, since they are the grounds of the sexual attraction without which there would be neither marriage nor family.

"But if we wish to come to the bottom of things, human love is essentially only rut in an intelligent being; it exalts all the vital forces of man, as rut excites those of the animal; if externally it appears to differ, it is only because, in man, the desire of generation, the most primordial want of all, on reaching his developed nervous centres, awakens a whole psychical life unknown to the animal.

"There is nothing marvellous to the naturalist in this genesic explosion, composed of altruism and egotism; but we know too well that it has not been the same thing with a number of celebrated writers and philosophers, but little acquainted with the biological science. A belated metaphysician who has become fashionable of late years, Schopenhauer, adopting the old stereotyped idea which makes Nature an anthropomorphic personage, has gratuitously conferred upon it a deep and diplomatic estimate; it is advisedly that she intoxicates individuals with love, thus urging them, without their suspecting it, to sacrifice themselves in the higher interests of the species. The glance which we have previously cast over the processes of generation in the animal series from the lowest scale up to man is enough to refute this dream. I will not speak of it at any further length; but what is of great interest is to discover how the superior animal species behave when they are seized with the desire to love, and to note the principal features of their amorous psychology; for, here again, we shall have to point out more than one analogy with what occurs in man, and we shall see later, both in animals and in man, some relation between the manner in which the sexual attraction is felt and the greater or less aptitude for its durable appearance and, consequently, for marriage and the family. Without giving longer time than necessary to these short excursions into animal psychology, it is convenient however to stop there for a moment. In fact, they throw a light upon the origins of human sociology; they compel us definitely to break with the abstract and commonplace theories upon the subject of the family and of marriage which have inspired such a surfeit of empty writing upon those subjects. The root of humanity goes down into animality; it is in the latter therefore that we must seek for the first origin of human sociology."

Before studying with Letourneau the Love of Animals from the psychological point of view, and thus furnishing the proof of the deep axioms which we are about to reproduce below, let us give the general rules which, according to Tillier, are applicable to rut in the animal series.

General Rules of the Rut in Animals. "We may however, as it seems, arrive at the following conclusions.

"1st. The rut, (giving to this word the meaning of the period during which creatures are impelled by their instinct to reproduction), always coincides with the arrival at the adult, perfect or sexuated age of the animal, and consequently an interval af time of greater or less length always elapses between birth and the period of life at which the sexual instinct appears. This period which is often badly delimited in the male, coincides with the first laying of eggs or ovulation in the female.

"2. Many species, generally of an inferior type, reproduce themselves only once in the course of their life, and the period of rut corresponds, with these forms, with the perfect state of the organism.

"3. The superior species generally reproduce themselves several times during their life. In some, after fecundation, all trace of rut disappears in the male and the female until the following ovulation; in others, the female sexual organs alone seem to pass through a period of complete repose, and the rut appears only to cease in the male by reason of the refusal of the female to accouple until the fresh season of love.

"4. In some species occupying the superior degrees of the animal scale, the sexual instinct exists at all times in both sexes, and the aptitude for accouplement is, so to say, constant."

(Tillier. *loc. cit.*)

We may now again take up, with Letourneau, the question of the Love of Animals, and it appears to us to be necessary to give the whole passage from the chapter in which he treats it, for, do not let us forget, the high position of the author at the *Ecole d'Anthropologie* gives an almost official sanction to his opinions. This book, we cannot repeat too often, is a popular, eclectic work, as is indicated by its general title of *Ethnology of the Genital Sense.*

CHAPTER XIII.

THE FORMS OF ACCOUPLEMENT AND GENERATION IN ANIMALS.

I. *Cold-blooded Animals. — Polypi. — Worms.. — Leeches. — Crustaceans.—Insects. — Serpents.—Eels.— Tortoises. — Lizards. — Frogs. — Toads. — Oviparous Fishes and Viviparous Fishes.—Fecundity of Fish.*

II. *Cetaceans.—The Coition of Two Whales.— Dolphins. — Manatus. — Spermaceti. — Whales. — Walruses.—Seals.*

The Forms of Accouplement and Generation in Animals. Letourneau has laid down the laws of the general processus of generation in the organic world. Let us follow him in his treatment of this question, starting from the lowest point of the animal scale, and we shall see by what a marvellous gradation the ascending progress of love may be followed from the zoophyte to man. A very original author, Amédée Cabral, whom we have already mentioned, has devoted 150 pages in his *Vénus Genetrix* to this study. We will extract the essence of it, omitting everything which does not apply directly to the subject.

Cold-blooded Animals.

" *Polypi.* Polypi are the most simple kind of animals in Nature; all their viscera are reduced to a mere alimentary canal and all their faculties to a certain irritability in all their parts; which distinguishes them from plants. These animals possessing no organs of generation are multiplied by *cutting* or *increase.* This latter mode consists in the tubercles which spring up round the mouth in the interior or at the exterior of their body. These are veritable buds which develope for a time upon the mother, which have a common life with her and which separate from her when they have acquired the means which enable them to take their food. These generations are so rapid that several of them often occur in the course of a day; that is to say that a child may grow, become a father and grandfather in this short space of time.

" *Worms.* Worms are generally oviparous or hermaphroditic; but there are many of them androgynes. Many enjoy moreover the power of renewing their truncated parts. The organs of generation in the greater number of worms are of the most simple description. Acephalous molluscs are sufficient for themselves, for we see eggs either in the ovaries, or in a particular liquid. In others, we can distinguish the male organ which emerges unrolling itself like the horns of helices. All of them lay their eggs in spring, but those which are found in the body of animals must produce at any time.

" *Leeches.* Among leeches, which swim in the same way as eels, the males and females have organs like snails, and their young are born at the beginning of spring.

" *Crustaceans.* Among crustaceans which resemble insects in their organs of movement and their nervous system, the sexual organs are easily remarked, placed, both in the male and female at the root of their hind feet. We have been able to observe the accouplement of crayfish; when the male attacks the female, she throws herself on her back, and then they embrace very closely by means of the feet and the tail; after which, at the end of a mouth, the female is full of eggs. Their way of laying their eggs is remarkable. They have the knack of attaching their eggs to the moveable filaments which are found beneath the tail, and carry them there until the young ones are hatched. For the first few days after their birth, the young ones find a retreat under their mother's tail, just in the same way as chickens under the wing of the hen. When the mother is at rest in the water, they are to be seen coming out from between her legs, just like chickens from under the wings of the hen, and then, at the moment of danger, retiring all together into their sanctuary; but fifteen days are enough to bring them to a state when they can live alone.

'*Insects.* Insects, with crustaceans, are the only animals without vertebræ, in which, the sexes being separated, accouplement is performed by the intromission of the male organ into the sexual part of the female and by the ejaculation of the seminal liquor into the ovaries. All the individuals in this class of insects are males or females, except among some such as ants and bees, where there are neuters, which are unfitted for generation; but these kinds of mules themselves come from males and females of the same kind, which have accoupled.

'The parts of generation, in insects, are ordinarily placed at the extremity of the belly; in the majority, if this extremity of the body is pressed, the said parts emerge. Nevertheless they are not always situated so. In spiders and some others, the organ of the male is found in a place where one would not think of looking for it; it is situated in the feelers. In dragon-flies, the sexual part of the male is placed quite close to the chest and that of the female is found behind. For accouplement, the male seizes the neck of the female with the little hooks with which his tail is armed, and when he holds her so, it seems as though accouplement would never be effected in this way, nor would it be accomplished at all, if the female did not do the rest of the work. The latter thus pressed and harassed by the male, who does not leave her, accedes to his desires; she bends her belly forward, which is very long, and makes the extremity of it come under the corselet of the male, and thus the accouplement is effected, either in the air on some plant where the operation is terminated.

"In many kinds of insects, the male mounts on the back of the female and remains in this attitude all the time that the accouplement lasts. The male butterfly, the male bug and others, after uniting with the female, place themselves in the same line with her, like dogs and wolves. Cicalas and grasshoppers keep at one another's side.

"When the accouplement has been effected, the females must devote themselves to the laying of their eggs, which are of two kinds, according to species: one membranous like the eggs of turtles and reptiles, the other calcareous like those of birds. The variety of these eggs is incredible; some are round, others elliptical, others lenticular, others cylindrical, others pyramidal, others flat and others square; some are smooth or even, others grooved and displaying a curious work. There is the same wealth as regards colour; pearl-grey, yellow, sulphur-yellow, or golden-yellow: some are white, some black, some green, some brown and of all shades. The young one remains in the egg until its superabundant humidity has been dissipated, and its limbs have acquired sufficient strength to break the shell and emerge from it. Insects which have to pass the winter in their shells do not emerge from them until the growth of the leaves which will serve them as food.

"Insects which do not have wings, (apteræ), are born with the same shape which they must always retain. But all the rest, on the contrary, experience such great changes that the adult individual bears no resemblance to what it was at birth. It has not only other colours, other tissues and other features, but other movements, other shapes, other proportions, other organs and other processes. In the first period, the insect is produced in the shape of a worm; a larva in some, a caterpillar in others. In the second, it is the form of a nymph or chrysalis, in which the insect acquires its limbs in a species of shell which completely hides it. In the third period, the insect attains all the organic perfection admitted by the rank which it must occupy. All its limbs, previously folded, soft and without action in its shell, unfold, gain strength and come into play; borne upon six feet, it walks slowly on the ground; carried by two or four wings, it flutters lightly in the air.

"In the dipteræ, (two-winged), such as flies and mosquitoes, the accouplement is effected in a very curious manner: the male has two kinds of pincers or hooks behind, with which he seizes the posterior part of the female, so that she cannot escape him, but this is all that he is able to do; the rest of the accouplement depends upon the female. The latter then lengthens out a kind of cone of flesh, underneath which is found the sexual part. She must introduce this projection into the body of the male to receive the masculine organ which does not emerge at all; so in these insects, it is the male which has an opening suitable for admitting the sexual part of the female. This paradoxical disposition is probably of use to the female who proceeds to lay her eggs in dead or living flesh. The gad-fly disposes of her's on oxen and other quadrupeds, and the hide must be completely pierced in order to lodge the egg, and preserve the larva which thus finds protection and food.

"It is towards evening that the accouplement of mosquitoes and gnats takes place. The males assemble together, fly continually from side to side without going away from one another, and the females proceed after them; as soon as a male sees one of them appear, he approaches, joins her in the air, lays hold of her and they fly together in the air fastened to one another behind. The female being fecundated, proceeds to dispose of her eggs; she places them in the water, in order that the larvæ when they are born may be able to enter the element in which they must live. While laying their eggs, the females cling to some object floating in the water, cross their hind legs and deposit their eggs upon this angle. In proportion as the mass of eggs increases, it grows longer and takes the shape of a small boat; and when the insect has laid her last egg, she leaves her little boat which floats on the water at the will of the winds. The gnat, (or mosquito), remains in the form of a nymph for only eight or ten days, after which it becomes a perfect insect. There are several generations of these insects in the course of a year, and each female lays about 300 eggs a year.

"In the apteræ, (wing-less), we must point to the fleas, our most implacable enemies. The sexual organs of the male consist in a cylindrical, swollen, truncated piece of flesh, lodged between two valvules, on the interior and concave surface of which there is a scaly hook. The accouplement of these insects, so disagreeable to man, displays a singular fact. The male is placed underneath the female; the belly of one is rested against that of the other, and their heads are facing. They lay twelve eggs, which are hatched at the end of five or six days, when the season is favourable, and the rest remain hidden in our apartments, or in other places until the heat causes them to hatch.

"In the majority of four-winged insects such as cockchafers and beetles, accouplement is absolutely necessary for their reproduction; but this accouplement can only take place when they have reached their last stage, that is to say, as perfect insects, the life of which is very short. The males perish immediately after accouplement, and the females as soon as their part is completed. Thus all those which have accoupled in the course of the spring and summer, perish a short time afterwards; those which are born in autumn and have not had time to accouple, pass the winter in a state of torpor, and wake up in spring to engender and then to die, after a single accouplement which is sufficient to fecundate all the eggs of the female, whose genital organ is equipped with a kind of auger in the insects which deposit their eggs in wood, in the ground or in any solid body. As these females are unable to take any care of their eggs, since they perish after laying them, they are careful to place them near the food which is suitable for the larvæ which come out of them.

"The cockchafer lives for scarcely a week, and the whole species appears for hardly a month. The cockchafers accouple almost as soon as they come out of the ground and remain united for about twenty-four hours; during this time the male, who is slightly smaller than the female, is placed on the back of the latter and holds her in his embrace until, weakened and almost exhausted, he turns over on his back and allows himself to be drawn along for some time by the female; he remains in a languishing state, takes no food and dies soon afterwards. As soon as the females are fecundated, they excavate in the ground by means of their fore-feet which are armed with strong teeth, a hole about six inches deep, in which they deposit their eggs side by side. When they have finished laying, they return to the trees where they perish from exhaustion a few days after.

"The beetle has scarcely issued from the nymph before it is in a state to accouple like the majority of insects. As long as it is warm these insects accouple very often, remaining united for a long time in this act, and they may be swept up without being disturbed. They can multiply to such an extent from the end of April to September in our climate, that a single pair can produce six thousand beetles.

"Besides the destructive beetle we have the innocent cricket who is fond of our houses. His *cri-cri*, although sad, is an accent of love, since it serves him solely to call his female, who is dumb. In summer time the field-crickets make themselves heard towards sunset and during the whole of the night. The sexual organ of the male is situated quite close to the abdomen, from which it is made to emerge by pressure; it is furnished with two hooks which enable it to hold the female during accouplement. The latter lays in July and August nearly 300 eggs. The young ones are hatched fifteen days afterwards and feed on grass until they are able to hunt for other insects; in winter, they hide under the ground without taking any food. But in spring they reappear, and hollow out a hole which serves them as a habitation where they keep on the watch.

"*Bees*. The whole swarm of bees has only one mother, the queen, whose privilege consists in being able to choose among a hundred males the one who must cooperate with her in the propagation of the race. A certain quantity of cells in the hive is intended to preserve the honey. The queen lays her eggs in the others, but the cells of the future queens are much larger than the rest. These queens only lay aside their nymph-skin one after the other; this is certainly in order that they may not come out of their cell at the same time; for as their instinct leads them to destroy one another, none would remain to lead the swarms.

"We must believe that it is in consequence of this instinct that some days before the birth of a young female, the old one places herself at the head of the colony which goes to establish itself elsewhere, and that the hive becomes the patrimony of the new-born female. If the hive is populous enough to furnish a second swarm, the latter places herself at the head of it and yields the place to another female: but if the hive is poor, as soon as a fresh female appears there, a combat arises betwen the two competitors which always ends in the death of one of the two. Five or six days after its birth, the young bee, feeling the imperious want to unite with an individual of her own species, leaves the hive and proceeds to search for a male. This single accouplement is sufficient to vivify all the eggs which she must lay during two years and perhaps even all those which she lays during her life. But the male which contributes to give life to so many thousands of creatures does not enjoy the pleasure of seeing his numerous posterity, for he dies, if not immediately, at all events a short time after accouplement, from the fatigue of the said exercise. He is a poor victim of conjugal duty!

"*Ants*. In the same way as bees, ants form a society composed of three kinds of individuals; males, females, and workers or mules. The sexual parts of the females cannot be seen without a somewhat strong pressure; they are situated at the extremity of of the last ring. The greatest similarities exist between their organs and those of the workers, which leads us to suppose that they are, like worker bees, *impotent* females, whose organs of generation have not had a perfect and entire development, and that, like the worker-bees, they are intended for work. While the workers come and go, the females remain in the interior of the nest, occupied solely in laying; they never quit their habitation except to accouple, and in summer evenings the two sexes are often found joined together; the ground is frequently covered with these couples. The males die after having accoupled, or do not return again to the ant-hill; the females, on the contrary, remain there at least partly; then the workers tear off their wings in order to oblige them not to abandon the republic and to lay their eggs in it. The first winged ants appear at the end of July, and form such considerable swarms that one is led to believe that ants establish colonies like bees.

"*Snakes*. The accouplement of snakes is effected in spring, under a bright sun and on the bare ground. There, in their generous embraces, they rub together, twist and join in a veritable intromission. The male has a double organ, in order to fecundate each of the two ovaries of the female, and the operatiou lasts for several hours. At the end of a few weeks the female lays numerous eggs which she hides in the sand, without taking any care of them; and the warmth causes them to hatch ten or twelve days afterwards.

"In almost all the venemous kinds, the eggs are developed internally, and allow the young ones to emerge perfectly formed, as occurs notably in the case of vipers, with regard to which many erroneous accounts have appeared.

"*Eels*. Many volumes have been written regarding the generation of eels, but it is now known that they accouple like snakes; they produce eggs which are most frequently hatched in their belly.

"*Turtles*. Sea-turtles, in spite of their shell, mount upon the back of the female and remain accoupled for *fourteen* days; they lay their eggs about the middle of spring. Then they repair to the shore by night, dig a hole, and lay in it about a hundred eggs which they cover with sand. This operation is performed with such care, that turtles, at other times exceedingly timid, no longer think of danger; it is then, as they are returning, that they are caught. Freshwater turtles lay much fewer, and land-tortoises not more that five or six eggs.

"*Lizards*. Lizards, like snakes, change their skin at the beginning of spring and then proceed to the reproduction of their species. Love in lizards, as in the majority of completely organized creatures, is a violent sentiment, which often leads them to fight, and exposes them to dangers of every kind. The accouplement is so close that it is often hard to distinguish the individuals taking part in it. The eggs which result from it are hatched by the mere effect of the heat of the sun.

"*Frogs*. At the return of spring, frogs also occupy themselves with reproduction. The male mounts upon the back of the female in accouplement, embraces with his forelegs the upper part of her belly, and remains united with her for several days. The eggs are laid shortly afterwards and become tadpoles: at the end of fifteen days, the eyes and the rudiments of the hind legs begin to appear; after a similar period the latter are formed and the forelegs begin to show; finally, at the end of three mouths, the tadpoles are changed into frogs.

"*Toads*. The accouplement of toads is the same as that of frogs, and naturally takes place on land.

Fishes.

"*Oviparous Fishes*. The fecundity of fish is considerable, on account of the large quantity of eggs which they produce, but on this very account there is generally but very little love between the sexes, and they leave to the care of nature alone all the young which are born; it is almost the same thing in reptiles and insects, with the exception of some less fertile species, such as spiders, and of the sociable races, such as bees and ants, because the existence of these latter is attached to their great number and their social state.

'Thus the fish knows only the material object of love, which is the fecundation of the eggs; for the two sexes are almost strangers to one another in this class of animals.

'Nevertheless, Nature has not disgraced the fish in the most important act of all, that of the reproduction of the species; she has adorned it at the time of spawning with the most striking colours.

'The generative faculty greatly augments the brilliancy of the colour of all animals and of fish in particular; at the time of spawning, the flesh of salmon becomes very red; some of the males are then covered with spiny scales which serve to protect them against the voracity of their enemies. All at that time become more courageous and robust, for the time of love is in all animals, the time of combat. It appears that the number of male fish is sometimes double that of the females in the majority of species; nevertheless, some kinds exist in which only a small number of males are met with, and they are so very few among sea-eels, and one species of fistulars, that it was supposed that all these animals were females.

'Several fish, in truth, have been met with which seemed to unite the two sexes in one single individual and were hermaphrodites; not uncommon instances of this are met with in whiting and carp. The parts of generation in fish, although inclined to an abundant fertility, are very simple; for it seems that the more complicated these organs are, the less easily are their functions performed, as in man and other warm-blooded animals. These parts consist, in fish, of double ovaries, placed in the lower part of the belly of the females, which, at the time of laying, are filled with an innumerable multitude of eggs. The males are provided with a double milt, a kind of whitish glandular body, placed along the back.

"It is usually in spring, towards the months of April and May, in our climates, that fish spawn; they come near to the shore and into calm water to dispose of their eggs. It seems that the large fish spawn the first. The lote spawns in winter and appears not to fear the cold. It is asserted that rays spawn several times a month and are even subject to superfetation. Other species also spawn several times in a year. Carp endeavour to place their eggs among the aquatic grasses; the tench, the eel and the roach prefer the mud and stagnant water, the same as other viscous fishes; but trout, perch and gudgeon prefer running water; salmon prefer the mouths of rivers, where the water is clear and the bank full of fine gravel. The annual migrations of herring, mackerel, salmon and sturgeon occur mostly at the time of spawning, and their principal object is connected with the generation of these animals. For this reason they seek for the places most favourable owing to their position and the food which they supply: besides, the same kinds, such as salmon, come to the same place each year to lay.

"*Fecundity of Fish.* The number of eggs laid by fish is extraordinary. An ordinary sized herring has as many as 10,000; a fish weighing half a pound had quite 100,000, according to Bloch; a carp, 45 centimètres in length, had 262,224, according to Petit, and another 52 centimètres in length, 342,144. There were 281,000 eggs contained in one perch and 380,640 in another. A female sturgeon laid 119 pounds weight of eggs, and as each of these eggs weighed a grain, the whole might be calculated at 7,653,200 eggs. Leuwenhoeck found as many as 9,344,000 eggs in one cod-fish. If it is calculated how many codfish lay as many each year, and if a similar calculation is made for every female fish of all the various kinds which inhabit our seas, the inexhaustible fecundity of nature indeed appears astounding. But fish themselves devour these eggs for the most part, and an incalculable number of them is lost.

"The eggs which have been fecundated can be distinguished from those which have not by the former being less opaque and a little more transparent than the latter: for it frequently happens that the semen of the male has not fallen upon all the eggs, and many remain unfecundated. The male and the female fish, in fact, have scarcely any affection for one another; they remain cold and indifferent; none of those jealousies and violent hatreds are to be met with in them which are the result of love. Only, in several species, the males and the females are to be seen passing and repassing one another, and thus rubbing their bellies together in order to hasten the coming out of their eggs and the emission of their milt; salmon, carp and perch have even been observed rubbing their anus against a pointed stone and thus pressing the capsula of the ovary so as to facilitate the expulsion of the eggs. It is certain that fish are excited to spawn by rubbing their anus and fins with musk, ambergris, castoreum, and other animal essences which appear to put them into a state of rut, just like birds and quadrupeds, for these odours excite the generative faculty.

"The eggs of fish are very small in proportion to the size of the animals which produce them; but they grow as they are fecundated and gradually increase in proportion as the small fish within is developed. The heat of the sun greatly accelerates this development, and, generally speaking, the small animal grows very rapidly in its egg; its heart is contracted from the second or third day after fecundation; the eyes are the first to appear, then the dorsal spine, the head and the pectoral fins. Finally, at the end of seven or eight days, especially in fine weather, the fœtus makes an effort to break its envelope by moving its tail; an opening is made and its tail comes out of the egg first.

"It has been asserted that the bull's-head makes a nest and sits upon its eggs; but it appears that no kind of fish takes this trouble, because their body is cold and unsuited for incubation; it is merely probable that the females watch over their eggs and perhaps prevent their being devoured by voracious males. It has been said that certain kinds swallow their eggs, in order, so to say, to incubate them in their stomach, and it has been declared that these females swallowed in this way the sperm of the males, so that fecundation took place in their mouth; and it has been added that the little ones when hatched went in and out of out of their mother's throat, as though it were a sanctuary, but these facts have been neither verified nor proved. It seems, on the contrary, more clearly demonstrated that fish take no care of their young, and, generally speaking, these animals have but little attachment to one another; the lump-fish is really the only fish which displays any affection for its female. As the eggs of fish are covered with a glutinous matter, they stick to the spot where they are deposited, and the young ones feed at first upon this glairy substance; for them it takes the place of the milk of quadrupeds.

"*Viviparous Fishes.* As there are viviparous fish, it is necessary that these fish should accouple, since their eggs are hatched in the oviduct of the females. Dog-fish and rays are even, in this respect, endowed with a peculiar organization; the males have two feet, of a kind, near the anus, which enable them to seize their females and keep them fixed during the act of generation as Aristotle describes it. It was thought, before Bloch settled what was the use of these appendices, that they were a double penis which the male introduced into the oviducts of the female, a theory which the German ichthyologist has refuted. These cartilaginous fish unite without intromission, the milt of the male falling into the oviducts of the female through a simple affriction, and fecundating the eggs there.

"Fishes of the cartilaginous family produce eggs which have the appearance of brown mud; they are corneous, quadrangular, flattened, and about two inches in length, with filaments at the four angles; they are called *rats de mer* upon our coasts, and are usually produced by rays. They lay but one or two at a time, but do so several times a mouth and are even subject to superfetation. Besides this they are fecundated by several males. The fecundity of cartilaginous fish is, however, much less than that of other kinds, because they are a very destructive race. In fact, Nature does not multiply animals of prey so rapidly as those animals which serve them for food, as we may observe in birds and quadrupeds.

'The oviducts of viviparous fish are more spacious than those of oviparous fish, as the eggs have to be developed in them. The manner in which this is effected is similar to that which takes place in vipers and other pseudo-viviparous animals, for it is nothing but an incubation in the mother's belly, followed by the exit of the young from their eggs. Each young fish is enclosed in its egg but exists through its own life.

'The *silurus ascitus* also carries its eggs in its ovary until they have completely developed; this is effected in a very singular manner. The eggs of this fish, like those of turtles, are composed of yolk only and of a very delicate tunic which envelopes them; they grow in the mother's belly after their impregnation. The skin of the female's belly gradually grows thinner and tears; then the eggs detached from the ovary appear at the aperture, their envelope cracks at the place which corresponds to the head of each embryo; its mouth then appears, while the rest of the body remains enveloped in a membrane as fine as gauze. The young animal frees itself from it, and then appears bent round the yolk, with which it communicates through the umbilic. In this state it remains fixed to its mother's belly until the yolk is completely consumed, and, becoming then less voluminous, it can emerge through the hole of its mother's belly: all these young fish are therefore brought to light by a Cæsarean operation which is effected naturally in this species.

'*Syngnathi* have scaly plates near their anus which swell in spring: underneath these plates are two partitions, or ovaries, containing eggs enclosed in a very fine vesicle; it is in them that development is effected, as in the preceding species. In all these fish the young do not draw their nourishment from the mother by means of a placenta adhering to the matrix, as in the case of quadrupeds, but only from the egg which is detached in the ovary.

"It will be noticed that oviparous fish resemble insects from the point of view of generation; viviparous fish, on the other hand, resemble viviparous reptiles, but they do not have like insects, reptiles and batracians, coital accouplement. Certain classes of fish however, (eels, gymnoti, etc.), resemble snakes and are really amphibious, leaving the water to crawl on land, while water-snakes go from the land into the water in order to find their prey there.

"*Cetaceans.* The ocean moreover contains extraordinary monsters within its depths, and, confining ourselves to the family of cetaceans, what is there stranger than the whale, that animal which lives in the water like a fish and breathes like a quadruped? The male and female have a real coital accouplement; the female gives birth to young ones, which it suckles at its mammæ. The little whales suck for a considerable period, and the mothers do not leave them, for these animals live in herds; the males are monogamous and are satisfied with one female, an example which man has not always followed.

"The coition of two whales is performed on the side, belly to belly, because the elliptical shape of their body does not allow them to unite in the same way as quadrupeds; but nevertheless, there is an intromission of the male's penis into the female's vagina. If, between the male's penis and the size of the animal, there was the same proportion which exists in certain quadrupeds, such as the ass, bear or dog, the penis would be of the size of one of the columns in the church of the Madeleine at Paris or in the Acropolis at Athens. Happily it is not so.

"It must not however be supposed that Mr. Whale has nothing to show. His penis is still six feet in length by a good foot in diameter, constituting a very respectable weapon: it is surrounded with a double skin, which makes it resemble a knife in its sheath, of which only a part of the handle is seen. The female's organ differs in no way from that of terrestrial quadrupeds. On either side is seen an udder with teats like those of cows. Some whales have white udders, those of others have black and blue spots.

"A certain Russian author has asserted that these mammiferous fish raise themselves perpendicularly on their tails in order to accouple, that the male and female approach one another in this position, that they embrace with their fins and remain accoupled for the space of an hour. But such a feat of coition appears to us hard to realize.

"It is also declared that a pair of whales live together and never separate. The female goes with young for ten months, like certain belated widows who hasten to utilize the extra month allowed them by the law in order to present, before the three hundredth day, a legitimate heir to a buried husband.

"Mrs. Whale gives birth in autumn to our little whale, who when he is born is as large as a bull. The mother suckles it, holding it between its fins, which she also makes use of to guide and protect it.

"*Dolphins.* In proportion as whales are heavy, savage and stupid, dolphins are agile, familiar, and gifted with intellectual qualities. The former, which are hunted by man, have retreated to the polar seas where they live almost solitary. Dolphins, on the contrary, are to be found in every part of the seas which they plough up in wandering troops, and bring destruction to shoals of fish. The dolphins, armed with teeth, have a violent character, are carnivorous and depredatory, but nevertheless are also affectionate, capable of attachment, and less brutal than other cetaceans. Their instinct is more perfect, their nature more susceptible of sociability, more lively, more sensible and more delicate.

"Dolphins accouple in the *same way as men*, the female receiving the male between her fins. They have only two young at a time and suckle them with much tenderness; they carry them about on their back, or between their fins, when they cannot yet swim easily, and moderate their pace to suit them. Like the cat, the mother lies upon her side in order to give suck. Her milk is blueish and rather sweet.

Manatus and Spermaceti Whales. "These animals, with regard to fecundation and generation, resemble dolphins in the former and whales in the latter.

"*Walruses*. These animals, which come in the series of mammifers immediately after the cataceans, are powerful and majestic beasts which easily attain a height of twelve feet and a weight of 300 kilogrammes. The ferocity of man has caused them to seek refuge in the ice of the Arctic Pole. Their fecundation and generation displays the greatest analogy to that of seals, of which we shall speak next.

"*Seals*. Seals are carnivorous animals, for they feed on fish. They are gifted with remarkable intelligence, and with a charming physiognomy; the sweetness of their character is to be read in their large, expressive eyes. They much resemble the otter, which also is an amphibious species, and the nearest species to them going back from man.

"When free, seals practise among themselves the duties of fraternal solidarity, and give proof of an extremely sociable disposition; the males are full of deference to the females and of tenderness for their young. When captive, they promptly attach themselves to the person who takes care of them, and to the dogs who are given them to be their companions in servitude, sleep with confidence in their arms at the end of a few days, endure their frolics without a murmur, provoke them to play by their caresses and even go so far as to moan when their companions play without them.

"The seal barks like a young dog or young wolf, but he more frequently has recourse, in order to express his desires, to the language of the eyes than to that of the voice.

"The seals at the Jardin des Plantes in Paris hasten to the sound of your voice and give you their paw when you ask them. Their keepers are very fond of them and lament their decease. How much it is to be regretted that man, who early learnt to turn to account the natural talents of the dog and the horse, has not hitherto made better use of the eminent faculties of the seal, who as yet from his contact with modern civilization has only learnt to say *papa* and *mamma.*"

(Toussenel. *L'esprit des bêtes*, Paris, Dentu, 1882.)

The seals of large size, known by the names of sea-bears and sea-lions, live in large families, each of which is usually composed of an adult male, who is the head of the herd, ten to twelve females, and fifteen to twenty of young of both sexes. All swim in the sea with astonishing swiftness and unexampled lightness, and remain together in this way when they rest themselves on shore, where they walk heavily. The males often indulge in long and bloody combats. They fight to defend their females against a rival who comes to seize them and carry them away; after the combat, the victor becomes the head and the master of the family of the vanquished.

The accouplement of the sea-lion is preceded by several strange caresses; the female crouches at the feet of the male, crawling round him a hundred times; now and again she puts her muzzle close to his, as if to kiss him. The male, during all this ceremony, often seems to be in a passion and growls like a dog defending a bone against another dog who looks as if he was coming up to him; the supple and lascivious female then retires, but soon returns to lick her master's feet. After this long preamble, they throw themselves into the sea and pursue one another, romping about like young dogs. At length, when the male is ready, the female comes out the first on to the shore and turns over on her back, giving vent to little cries of desire. The male who follows her closely, throws himself upon her and coition is effected in this altogether human position. The coition lasts from eight to ten minutes, with the habitual movements of a male covering a female. Gestation lasts about eleven months.

These animals always select desert coasts to give birth to their young and to indulge in the pleasures of love. The young ones often play together, and when they happen to fight, the victor is caressed by the father, while the vanquished one is protected and succoured by the mother.

These are absolutely human acts!

CHAPTER XIV.

FORMS OF ACCOUPLEMENT AND GENERATION AMONG ANIMALS, (*Continued*).

The Loves of Birds, according to Toussenel.—Monogamy and Polygamy of Birds.—The Poetry of the Loves of Birds.—The Chaffinch.—The Green linnet.—The Sparrow.—The Redbreast.—The Warbler.—The Oriolo.—The Lark.—The Starling.—The Canary.—The Jack-daw.—The Cuckoo.—Combatants.—The Stork.—The Duck.—The Goose.—The Swan.—The Cock.—The Grouse.—Partridges.—The Quail.—Pigeons.—Turtle-doves.

The Loves of Birds. "Birds love much; some of them love always. They are the tribe of the privileged creatures of the Lord; for the favour of Heaven is measured for every creature according to the power which he has received to love.

"The world of birds is not that only in which they love the most; it is the first in which they love; it is by it that the word love is incarnated in the animal world.

"Even to the bird, and in all the lower kingdoms, Insects, Fishes, Reptiles, the generations transmit existence without any consciousness of their solidarity. The family does not exist; the mother and the little ones are ignorant of and sometimes eat one another.

"But with the bird is the beginning of song; the bird is the first-born of love; the earliest joy, the earliest tenderness, the earliest melody date back to it.

"And as God does nothing by halves, He has taken care to lavish upon His favourite creatures everything which makes them loved. He has scattered profusely upon the mantles of the humming-bird, the peacock, the bird of paradise and the golden pheasant, rubies, sapphires, emeralds, topazes, all the most brilliant and the best assorted tints in the scale of colours. He has chosen too, in the scale of sounds, the sweetest notes to accentuate the voice of the humble singing-bird. The bird is, after man, the only creature which can thank God by its joyous songs. But the heart of man and that of the bird must be content in order that they may raise their voice in song. And as love is a fancy passion for the complete unfolding of what is requisite in the first place: health and a clear blue sky, God has gifted the bird with the faculty of rapid locomotion which enables it to accompany the sun in its course and to realize the Utopia of eternal spring. The swallow and the turtle-dove, happy models of conjugal tenderness, are as ignorant of cold seasons as they are of cold hearts." (Toussenel, *Le Monde des Oiseaux*, *ornithologie Passionelle*, Paris, E. Dentu, 1859).

Monogamy and Polygamy of Birds. "Generally speaking, the birds of cold countries are polygamous, because there are but few males for many females in each species; ducks, geese, plovers and gallinæ are of this kind. Birds in warm countries, having many males and few females, are monogamous. But in polygamous families, the males are as vigorous as they are in monogamous families, which is necessary in order to make up for the lack of number.

"Polygamous males are less attached to their families than monogamous ones, because an affection which is too much divided is less keen and less durable; therefore, at the period of laying, those which have several females leave to them the task of hatching and feeding the young; the more ardent males are even observed to break and disperse the eggs in order to force the females to indulge in fresh amours; this is the habit of the male partridge; for we know that all birds recommence laying and make a fresh nest, though slightly less numerous than the first, if this be destroyed: they even begin again several times when this is necessary, and the season is not too far advanced. Besides this, polygamous males are jealous tyrants; they use force with their families and collect them in a kind of seraglio, of which they like to be sole possessors; if a rival appears, then war breaks out; cocks, quail, partridges, peacocks and nearly all polygamous males are naturally bold, choleric and always ready for combats. It is on this account too that Nature furnishes them with weapons, such as spurs, head-pieces, sharp points on the wings, between the beak and the claws. But the monagamous birds having each about one female which is sufficient for them, rarely fight. They attach themselves to their companion, assisting to build the nest, relieving her in turn of the fatigues of incubation, bringing her food and also supplying it to the young; in fact, they contract an intimate union and form a family in which pleasures and sorrows are equally shared. Sweet community, in which faithful spouses have but one sentiment and one heart; and in which love alleviates all evils. Of such sort are turtle-doves, ringdoves, parrots, magpies, and the small singing birds, while the ardent domestic fowl, with his loud voice, bristling his feathers, raising his crest, spreading his wings and rearing aloft his head, looks proudly at his adversary, defies him to combat and strikes him with repeated blows until he has reduced him to ignominious flight; sometimes even, insolent in his victory, he treats him as an effeminate, and comes in triumph into his seraglio there to satisfy his immense desires and to chastise his faithless or rebellious wives.

"If monogamous birds are more tender, polygamous birds are more ardent, contrary to what is observed in the case of men, where the monogamous are more ardent and bellicose than the polygamous.

"These tender caresses, these sweet effusions of love are preceded among singing birds, by lively allurements, and by those little manoevres of coquetry and modesty, by which females give a relish to the most ardent pleasures; but, among the polygamous kinds, these little delicacies of love, more touching perhaps than that passion itself, are unknown; the animal is restricted to the physical pleasures alone.

The Poetry of the Loves of Birds. "But in order to taste the poetry of the loves of birds, we must make a halt at the most interesting individuals of each species. Among the Passeres, such as the chaffinch, the green linnet, the sparrow, the robin redbreast, the warbler, the oriole, the lark, the starling, the goldfinch, the canary, the jackdaw, and the cuckoo, we shall find all the different manners of the universal passion of love. Among the Grallæ, the combatants and the storks, we shall recall the exploits of chivalry. Among the palmipedes, we shall admire the energetic love of the goose, the duck and the swan.

"Among domestic fowls, we shall have the interesting spectacle of a gentle polygamy, without tyranny or eunuchs, and with all the signs of the happiest love. The ecstasy of the grouse, the timidity of the hazle-hen, the ruses of partridges and quail, the knowing caresses of the pigeon and the turtle-dove, will interest us in their turn to the same degree as the gigantic amours of the great quadrupeds.

The Chaffinch. "The chaffinch begins his song in the early days of February. The male is of a jealous disposition and when he has once accoupled and established himself in the neighbourhood which he has selected, he allows no others to be near him; and if two males should meet, they fight fiercely until one gives up the position or succumbs. He never leaves the female while she is sitting, keeps very close to the nest at night, and gives it that elegant shape and solid texture which makes it one of the most beautiful in our country. He places it in the densest shrubs in the gardens and orchards, and even in fruit trees, but then conceals it with the greatest care. The female lays from 4 to 6 eggs of a reddish grey with black spots, which she sit upon for 13 days.

The Green linnet. "The green linnet which is of the size of the sparrow, has the same habits as the chaffinch. The female sits so closely that she can often be caught upon the nest. During this time and in the season of love, the male utters a sweet note; he plays about in the air, fluttering and describing circles round his nest, rising up by little leaps, and then falling backwards, beating his wings with movements which he makes only at this season.

The Sparrow. "If we wish to find brutal passions, we must study the sparrow. The males fight to the death to have the females, and the combat is so violent that they often fall to the ground. There are few birds so ardent and powerful in love; they have been seen, says Buffon, to join as many as twenty times in succession, always with the same eagerness, the same trepidations and the same expressions of pleasure; and, what is even more singular, the female seems to be the first to grow weary of a game which should tire her less than the male, but which may also please her much less, because there are no preliminaries, no caresses, no preparation for the carnal act, much petulance without tenderness and continual precipitate acts which indicate only a selfish want. How different is the caressing love of the pigeon!

The Robin Redbreast. "The robin redbreast has more aimable manners. He becomes a companion in the forest to the wood-cutter, warms himself at his fire, pecks at his bread, and never ceases all day to flutter around him. He displays affection for man at all times, and seems delighted to be in his company; he follows or precedes travellers in the forests and for a considerable time. In spring, which is the time when those who have migrated return, they are to be seen in greater members in gardens and orchards; but they hasten to enter the woods, where they find again beneath the foliage their solitude and their amours. The robin is the earliest of birds and, from the first light of dawn his song is to be heard; in winter it is but a twittering, composed of rapid, tender notes; but, in the season of love, he indulges in its full compass, ends it in louder modulations and intersperses it with pleasing and touching accents. He hides his nest close to the ground in the roots or clumps of ivy; in it, the female lays five to seven whitish eggs, speckled with red. The male sits upon them after midday, and, like the nightingale, he likes to be sole master of his surroundings.

The Nightingale. "The nightingale, which is of a timid and solitary nature, travels, arrives and departs alone. He appears among us at the end of March and remains in the hedgerows surrounding cultivated land; but, when the forests are covered with verdure, he retires into the woods under the thickest foliage; the shelter of a hill, the neighbourhood of a stream, the proximity of an echo are the sites preferred by the male, who always has two or three favourite trees on which he likes to sing, for they are often the prize of a combat to the death, the females in this species being less numerous than the males. Towards the end of April, each couple labours at the construction of their nest in the brushwood or underneath a hedge. Four or five eggs of a greenish brown colour are hatched in the course of twenty days. The male only concerns himself with the bringing up of the young until they can fly, while the female is occupied in building a fresh nest for the second brood.

The Warbler. "The warbler is the emblem of fleeting loves, as the turtle-dove is of faithful love; nevertheless, the gay and lively warbler is none the less faithfully attached, and the sad and plaintive turtle-dove is none the less scandalously licentious. The male black-headed warbler lavishes a thousand little attentions upon his female while she is sitting, and his love seems still to last after his desires are satisfied. Nothing can impair his tender affection, not even the loss of his liberty. When they leave the nest, the young ones follow their parents, hopping from branch to branch, and meeting again in the evening to pass the night together. All the family perch on one branch, the male at one end, the female at the other and the little ones closely pressed one against another.

The Oriole. "The oriole which is about the size of a blackbird, and quite as mistrustful, passes the winter in Africa. These birds come to us towards the middle of spring, and, as soon as they arrive, the male and female seek for one another, soon come to an agreement and place their nest at the extremity of the lower branches of lofty trees. The female displays great courage in defending her young, even against man. She has been known to be taken together with her nest, to continue sitting in a cage and to die upon her eggs. The young are a long while before they can provide for themselves, and, later on, each family reunites before migrating.

The Lark. "The common lark is the musician of the fields. Its pretty song is the hymn of gaiety which comes before the spring, and accompanies the first smile of dawn. High up in the air, the amorous male seeks to discover a female who responds to his desires; she remains on the ground and attentively watches her beloved one as he lightly descends to the spot where he will pitch, and gives him the sweet price of his love-songs. And yet these are no expressions of constancy: the male and the female, impelled by the same desires form only transitory unions. The female, after being fecundated, promptly makes her nest, hatches her four or five eggs in fifteen days, and her little ones leave the nest before they are covered with plumage.

Starlings. "The starlings' love-season begins with the first days of spring; then each pair is matched, and separates from the rest, but this union is not effected in peace. The males fiercely dispute for the females, and the latter do not have the right of choice; they belong to the victor. When they are once paired, they seek for a favourable position in which to place the cradle for their young; some of them will take possession of a woodpecker's nest, others lay their eggs in dovecots or under the roof of houses, but it is not certain that they construct their nest in trees.

The Goldfinch. "Towards the month of May, the Goldfinch, with his rich colours, makes his pretty voice heard, and draws the sweetest sounds from his throat. When the female is sitting, the male sits and sings on a tree close by; it is but rarely that he goes away unless he is disturbed; then he retires, but only for a short time; this is a feint upon his part so as not to reveal his nest: for, if one remains, he soon returns. The female displays a still greater attachment to her young, nothing can distract her from incubation; her constancy is truly admirable and she braves all, strong winds, storms of rain, and thick hail to protect her eggs, especially at the time when they are ready to hatch. Although goldfinches may accouple in an aviary this union is rare and not often fruitful in results.

Canaries. "We must make a halt here at the peculiar habits of canaries. There are some males which are of a melancholy and pensive disposition, singing only in a lugubrious tone, always dirty, and unable to please the females. Others are of such a mischievous character that they kill the female which is given to them: but these murderers have a fine plumage, sing melodiously and are very familiar. They cannot be paired, any more than those which eat their eggs. Again, we may notice among canaries individuals who are always wild, of a fierce, shy disposition, who will neither be touched nor managed like the rest. These children of freedom require a large aviary in the open air and do not understand being interfered with. There are other canaries, again, which are always cheerful and always singing, of a gentle character and a happy nature, good husbands, good fathers, susceptible to all good impressions and gifted with the best inclinations; they delight their female uncreasingly with their songs, disgorge their food to her every instant, relieve her in the onerous task of sitting, seem to invite her to change situations, sit themselves for several hours, and feed the yong when they are hatched.

" The male, as is the case with all birds, shews his ardour by raising his voice. This is not the way in which the female expresses hers: at most, a sigh of contentment which escapes her after listening for a long while to the male, who endeavours to excite her desires by transmitting to her his own; but when she is once excited, the hen canary feels great want for love, for she falls ill and dies when she is separated and he who has aroused her passion is unable to satisfy it.

Jackdaws. " To find the model of true fidelity, we must go to the Jackdaws, who when once paired, never leave one another afterwards. From the first days of spring they eagerly seek for one another, chatter unceasingly together, join their beaks as though to kiss, caress in a thousand ways, try all ways of uniting before they indulge in sexual love, and prepare to fulfil the object of Nature by all the degrees of desire and by all the gradations of tenderness; they never fail in these preliminaries even in a state of captivity. Each couple does not separate from the rest as is the case with all other species; all place their nests close to one another in tall trees, or in adjacent holes in the same building; but, before trees, they prefer rocks, the roof of some old deserted château, or the towers of the most loftly churches.

The Cuckoo. "Let us say a few words about the cuckoo, whose habits are so extraordinary. Everybody knows the song of this bird. It begins in April and ends in July. It is not certain that these birds pair. When the female flies, in the season of love, she is usually followed by two or three males, who shew themselves eager to obtain her favours. It appears that the males are far more numerous and that they often fight together over a female, generally without any choice or predilection, and that, when they are satisfied, they fly away and seach for fresh objects with which to satisfy themselves again and leave them in the same way without regret. It is true that cuckoos have no need for mutual affection or for a common love for their offspring, like other birds, as they have no nest to build, no eggs to sit upon, and no young ones to bring up.

"The female of the Cuckoo is of a flighty disposition and is not richly endowed with maternal affection. This distaste for the duties of maternity is the reason why, when she has laid her egg, she picks it up delicately with her beak, squeezes it into her capacious throat, and carries it about with her everywhere, awaiting the opportunity to place it in a hospitable nest."

(Toussenel, *loc. cit.*)

"The female cuckoo prefers the nests of warblers, green linnets, larks, robins, thrushes, jays, and blackbirds. Although she disposes of her egg in the nest of these birds, she does not always do so without experiencing a stubborn resistance on their part. What must appear astonishing is the complacency of the cuckoo's nurse, who so easily forgets about her own eggs and offspring and completely gives herself up to the care required by the stranger.

"The little cuckoo, when he comes into the world, is a very ill-shaped creature, with his back hollowed in the shape of a basin; but this deformity conceals a cruel aim on the part of Nature. The bird, almost as soon as it has come out of its shell, makes peculiar movements and extraordinary efforts to get anything which is in the nest, eggs or young birds, to fall into this treacherous hollow, and as soon as it finds its shoulders laden it gives an energetic thrust with its whole body, the result of which is that the burden is thrown over the edge. Now, at such a tender age, any fall is mortal, and the poor parents who witness the catastrophe, can do nothing but lament it, Nature having denied them the means of preventing it. The son of the stranger does not stop in his work of destruction until he has made himself absolute master of the dwelling, and exclusive possessor of the affection and care of his adoptive parents, to the prejudice of their legitimate heirs. As the appetite of these intruders is insatiable, and as he takes as much room and absorbs as much nourishment alone as five of his foster-brothers, he must have recourse to these cruel proceedings which he adopts in order to live. It is a case of the proverbial saying: "Hunger justifies the means." (Toussenel, *loc. cit.*)

We add nothing to what Toussenel says about the habits of the cuckoo, the sole animal which deliberately has its progeny nursed by another bird.

"Among Grallæ we must point especially to the Combatants. The name of combatant which naturalists have adopted for this species of plover, is suitable for birds which we imitate. Not only do they indulge in single combat among themselves, but they also fight in regular troops, ordered and marshalled one against another. It is not to satisfy the avarice and ambition of the chiefs that they fight thus; love is the sole cause of these combats, the only ones which nature seems to approve, since she occasions them by the disproportion she has created between the number of males and females; these phalanxes therefore are composed of males only. The females, it is said, await at a distance the end of the battle, enflaming the ardour of the combatants by little cries, and constitute the prize of victory; the struggle is often prolonged and sometimes bloody: the vanquished take to flight, but their warlike fury, which is only produced by their amorous ardour, is rekindled at the cries of the first female they hear, They forget their defeat and enter on the struggle afresh if any antagonist presents himself; this mimic warfare takes place every morning and evening in the months of April and May. At this season, the males are in their war plumage which serves as a protection.

Storks. "The constancy of storks in returning every year to the same place is well known, as well as the signs of joy and the caresses given by the male and female when they reach their nest after a long voyage. Infidelity, even the appearance of it, sometimes costs the female her life; for if some hen's eggs are placed in the nest, when the chickens are hatched, the male, on seeing these strange figures, makes a terrible noise, and thus attracts round the nest a multitude of other storks who peck his partner to death, while the pseudo-cuckold utters lamentable cries.

"The stork has a great affection for its young; when they begin to fly, the female bears them on her wings and will die when necessary in their defence. But it is a remarkable thing that young storks have also been seen lavishing tender care upon their parents when old and feeble, and bringing them food during a long illness. This touching instinct for assisting age did not escape our ancestors' observant eyes. If the stork has been highly regarded, if it was made an object of worship by the ancient Egyptians, if even now people are persuaded that it brings luck to the house where it establishes itself, it owes it to its moral and beneficent qualities.

The Duck. "The species of duck is divided at the present day into two distinct tribes, one which has preserved its liberty, and the other which man has made captive and which breeds in our farmyards. The free portion of the species lives in numerous flocks which are essentially nomadic, and migrate according to the season from North to South and *vice versâ*.

"About the beginning of March, they cease to live in flocks; the males seek for the females, dispute and even fight for them: the couples go off together separately and hide among the reeds, whence they come forth only at night. Together with their natural voracity, ducks have considerable ardour for the act of generation. I have seen, says Cabral, a mallard pursuing a duck for a long time, which at length accorded him her favours. Everybody knows the singular shape of the male organ, twisted in a spiral form and quite visible at the moment when it emerges from the female's cloaca: it makes children imagine that the mallard has swallowed a small adder.

"The duck's nest is made sometimes in a thick clump of reeds, sometimes in places away from the water. Sometimes too, the duck takes possession of old nests abandoned by magpies or crows upon very lofty trees. In the latter case, the father and mother take the little ones in their bill, and carry them to the water one after another. The incubation of the eggs lasts for 30 days, and the male confines himself to remaining on the watch near the nest. One male is sufficient for eight or ten females in the domestic state, in which mules are easily produced between the Indian and the common duck.

The Goose. "Like the duck, the wild goose, which nests upon the shores of the Polar Seas, is a bird of passage and the harbinger of frost. The fecundity of domestic geese is extreme, for they may lay as many as three times in a year, each laying composed of twelve eggs. It is asserted that one gander is sufficient for eight or ten geese. M. Saint-Genis has assured himself that wild geese pair like pigeons and partridges. He has even observed that when the number of males exceeds that of the females, no contest occurs between the males; the accouplements are effected without noise and probably by respective choice.

Swans. "The unions are not always so peaceable among swans. The first bond which unites these animals is that of love; it could not be more tenderly or more closely joined; the amorous couple is full of lively ardour; delicate attentions, tender and prolonged caresses and all the gradations of pleasure form the enchanting picture of the amours of the swan. A love so keen admits of no sharing, and jealousy sometimes comes to sow discord, to produce bloody quarrels and excite the cries of war instead of the sweet murmurs of pleasure. If a rival appears to wish to carry off a beloved female, the happy lover, forgetting his sweetness, becomes savage and fights with desperation: often a whole day is not enough to finish the quarrel: the combat begins with heavy blows of the wing, the combatants being closely engaged, and generally ends in the death of one of the two, for they each try to strangle the other, holding him by the neck and trying to keep his head under the water by force. The male displays the same courage when it is a question of defending the fruit of his amours, and he shares with his beloved companion the care and attention demanded by their infant family.

"The genital organ of the swan is the size of an adult man's finger, and several centimètres in length at the moment when coition ceases.

The Cock. "With the *gallinacae* we come to complete polygamy, for a cock surrounded by his hens may be compared to a Sultan in the midst of his seraglio.

"Ardent and full of vigour, the cock multiplies his enjoyments. To effect the conquest of the hen he prefers, he approaches her obliquely with his eyes on fire, his wings stiff and lowered upon his sides, his tail spread out and giving vent to a hollow, but lively note. He leaps in this way upon the hen which crouches down. The double male organ of the cock, hidden in the interior, is prolonged towards the sole orifice displayed by the hen and vigorously applied there; one instant is enough for this act, the short duration of which is no doubt compensated for by the activity of the sensations: the cock stands up, shakes his wings, flaps his sides and sings of his pleasures, whilst the hen bristles her feathers, shakes them, remains silent and mingles with her companions again.

"The cock begins to pay court to the hens from the time that he is three months old; his greatest vigour lasts for three years, though he may live to the age of ten. The young cock has a clear, shrill voice: a one-year-old cock a strong and vibrating voice, like the sound of a clarion; the unhappy capon has only a hoarse and dull voice. So the wicked French peasant says that the first sings: "I do it when I can;" —the second: "I do it when I like;—to which the poor castrate replies: "You are very lucky!"

"In the wild state, the cock, as we have been able to assure ourselves in Indo-China, has only one hen, for without that, the latter would never be able to sit on her eggs and go and find her food. Moreover, the domestic cock seems not to have lost all recollection of his primitive habits. Sometimes he takes away a favourite hen into a corner, makes a nest there, and seems to invite his female to lay her eggs by lying there and commending the convenience of the place. At other times, he perches upon the edge of the nest where his favourite hen is laying, in order to offer his services to her, appearing disposed to forget everything for her sake, especially if she is young and pretty. He overwhelms her unceasingly with favours, gifts and attentions; and the favourite is very sensible of his preference. She almost always accompanies him when he is searching for food: she is the first to attend to his call, to receive from his beak the grain which he has found, and we may suppose that she would willingly follow him if he wished her to go and live with him under the laws of nature, far away from the haunts of men and, above all, *far away from other hens.*

The Grouse. "The love-season of the grouse begins towards the middle of April. The male becomes completely intoxicated with love; he is to be seen upon the trunk of a tree with his head-feathers raised, his wings trailing, and his tail spread out, assuming all kinds of extraordinary postures as he moves, coming down to conceal his females, and getting up again a short time afterwards on the branch which he has selected for the display of his amorous follies. Though very shy as a rule, these birds may be surprised very easily when they are agitated by violent desires, especially when they utter their call. The sight of man, even the report of a gun cannot distract them from this ecstasy. It might be supposed that they were deaf and blind, but they are only in love. Each female, when she is fecundated, lays away on the moss eight to sixteen eggs which she sit upon like a hen.

"The males are naturally shy and fond of solitude: each one appropriates to himself a small district in which he allows no rival; and he does not seek the company of his females except when spring rekindles the flame of love with fresh vivacity. This species is of the size of a pheasant. The small grouse with the forked tail has the same habits and the same passions.

Partridges. "The grey partridges begin their amours at the end of February and hardly lay with us before the end of May. The choice is not affected without fighting between the males and sometimes between the females; but when the couple have once paired they do not part again and live in perfect union. The male keeps continually in the neighbourhood of the nest, and follows his companion when she leaves it in search of food. The young run as soon as they are hatched, and the male leads them about like the mother, calls them repeatedly and warms them.

"The red grouse which are less sociable than the grey, keep farther apart from one another, do not all go away at the same time, and show less eagerness in recalling one another. Each couple goes away separately in spring, but when the males are satisfied and the females are sitting, they leave the charge of the families to them, and gather in large covies, on which the sportsman may fire without any fear of destroying the species.

Quail. "The quail is more amorous than the partridge. The male is so ardent that he has been seen to repeat his intercourse twelve times in one day, with several females without distinction: he runs at the sound of their voice with such precipitancy and with such disregard for his own safety, that he comes into the very hands of the sportsman to seek for them; but the female does not run to the voice of the male, and she contents herself with summoning him by a short cry which he hears half-a-league away.

The Pigeon. "There is no species of bird which is so widely spread or so numerous as the pigeon, nor is there any which displays so many varieties.

"The act enjoyed by the two sexes is, in every kind of pigeon, almost always preceded by caresses. The male gives the female something to eat in the same way as they both disgorge food to their young; the female, in a stooping position, then receives the male whose desires end in an instantaneous contact. Each hatch consists of two eggs, which usually produce a male and a female. It is the habit of the male to look after the nest first and to invite the female to go to it. At the approach of the female, he displays his feelings by flapping his soft wings, to which she replies in the same manner, and the pair, squeezed together upon the nest, seem to have a foretaste of the pleasure of caring for the young which will be soon born. The female sits from three o'clock in the afternoon until about eleven o'clock the next day, and the male then takes her place; but if she is late in coming, he goes to seek for her and invites her to return promptly to the nest; she does the same with regard to him, and thus they get on pretty well together.

Turtle-doves. "Turtle-doves differ in no way from pigeons in their nature and ways; they have the same instinct and the same habits, eat and drink in the same way and gather together in more or less numerous flocks at a certain season. There is a similarity also between them in their mutual caresses, in their actions, and the bowing of the male in the female's presence, in his invitation to her to occupy herself in the construction of the nest, in their voice, or rather in their plaintive wailing, in the number of eggs laid by the female and, lastly their history is a repetition of that of pigeons.

"Nevertheless, the turtle-doves of Europe differ from pigeons in their licentiousness and inconstancy; in aviaries the female may be seen abandoning herself indiscriminately to all the males; even in a wild state, females have been seen to make two happy upon the same branch. The turtle-dove should be rather the emblem of immodesty than of fidelity.

"The amorous ardour of these birds, dedicated by the ancients to Venus, is so great that if some males are placed in one cage and some females in another, they may be seen accoupling together as though they were of different sexes. But these excesses are observed more frequently in males than in females; they will make alternately the same salutations, will accompany them with the most tender coos and will give one another the same kisses which are due to the females alone. Therefore, if the female turtle-dove is a Messalina, the male is occasionally inverted!

"It is therefore very wrong to quote turtle-doves as a model of conjugal fidelity, but it is right to put them forward as a model of voluptuousness: their actions, their department and all their movements are voluptuous, and they seem to live only for kisses and caresses."

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CHAPTER XV.

Forms of Accouplement and Generation in Animals (*Continued*).

Generalities on the Accouplement of Mammifers.—Effects of Rut upon the Sexual Organs.—Duration of Gestation.—Number of Young.—Number of Teats.—Lactation.—Vivacity of Love in Mammifers.—Forms of Love in Horses.—Asses.—Cows.—Sheep.—Goats.—Roe-deer.—Fallow-deer.—Red-deer.—Dogs.—Foxes.—Badgers.—Philander of Surinam.—Squirrels.—Dormice.—Hamsters.—Beavers.—Otters.—Moles.—Cats.—Tigers.—Lions.—Bears.—Elephants.—Rhinoceroses.—Hippopotami.—Camels.—Sows.—Hares.—Rabbits.

Generalities on the Accouplement of Animals.

"We are acquainted with the Rut which is developed in mammifers after puberty and which only occurs at fixed times. There is a twofold reason for this physiological law. It is necessary, not only that the body should have acquired sufficient growth for the animal to be pubescent, but also that it should be in a state of strength and vigour proper for engendering.

"Man requires to be 14 or 15 years old in order to be capable of reproducing himself; even at this age he is too delicate and imperfect to impart life to robust individuals. The elephant and the rhinoceros are unable to engender before the age of 16 or 18; camels do not usually reproduce before they are 4 years old.

Although the horse may already be capable of engendering at the age of 2 1/2 years, he nevertheless produces only very weakly foals, and he does not engender the best until he is 5 or 6 years old. It is the same with asses and zebras. Buffaloes, lamas and the large apes take 3 years to grow before they reach puberty; but the bull, the bear, the lion, the leopard and the wolf are in a state to propagate their species at the end of 2 years. Eighteen months are required by fallow-deer, moufflons, stags and roebucks: one year by goats, gazelles, sheep, rams and pigs. Sows have even been known to bring forth three months after birth. Dogs, foxes, cats, hedgehogs, ferrets, martins, polecats, weasels can reproduce their kind after the eleventh or twelfth month following their birth. A slightly longer period is required by dormice, squirrels, hares, rats and field-mice. Rabbits bring forth young as early as the 5th or 6th month, and lastly, guinea-pigs are still more precocious and able to engender when they are 5 or 6 weeks old: therefore with a couple of these individuals taken when they are in litter, it is possible to obtain a thousand individuals at the end of a year, for they produce eight times every year: their gestation is only for three weeks, and lactation only lasts for from 12 to 15 days, while each litter consists of 6 or 8 young ones. If such a species could reproduce their kind without any obstacle and none of them were destroyed, they would soon occupy the whole earth. It would be the same with mice, rats, and many other races of animals, and we thus see how powerful a force is the reproductive power of nature.

"The large species are less productive than the small and less subject to varieties of race. They do not engender until they are fully grown, while the smaller species do so at an early date; but their progeny is less perfect and the type is more variable; this is doubtless why rats and other small species have so many congenerous varieties, while the large species have hardly any at all. Moreover, the first litters are less numerous than the later ones, and domesticity, which has so much influence upon generation, changes the primitive species; it is on this account that we have so many different breeds of dogs, cats, and horses, although the species was originally the same in all.

Effects of Rut upon the Sexual Organs. " At the period of rut, the sexual organs of animals are in a state of remarkable development; the parts swell, become red and, as it were, inflamed; all the females are provided with a clitoris which increases in size at this season, their vulva partly opens and allows a hunour tinged with blood to escape, similar to the menstrual discharge; females of the monkey tribe experience this kind of menstruation several times during the course of the year, but at irregular intervals. The aged females among quadrupeds come on heat sooner than the younger, on account of previous accouplements. The females of animals practise a kind of coquetry, for they know how to kindle the desires of the males, and do not always yield to their first attempts.

" The majority among them do not receive the male again when they have once conceived; however, the females of monkeys, of several kinds of rodents which are subject to superfetation, of dogs, and of wolves receive him again after conception.

Duration of Gestation. " Generally speaking, the longer the period taken by individuals to reach their full growth, the longer is the period of gestation, and the more precocious a species, the less time is occupied in gestation; some variations, however, are to be met with in this rule. The cow goes with young for as long a time as a woman, although the former acquires its complete development in three years; the lioness, which engenders at the end of two years, carries her young for three months and a half, while the she-goat, which receives the male when one year old, carries her's for five months.

"The duration of gestation bears no relation to the size of the animals, although in some way it enters into it; for we observe that the elephant carries her young about ten or twelve months, the camel for eleven, the pig for four, the wolf for two months and a half, deer for eight, bears for six or seven, the chamois for five, the otter for three, martins and dogs for two, squirrels for 40 days, rabbits for one mouth, and guinea-pigs for three weeks. The lioness, however, which is much larger and stronger than the timid gazelle, carries her young for less time than the latter; the ass and the zebra, which are less massive than the cow, have a longer gestation by two months. It is the same with several other species.

Number of Young. "The number of young, although more considerable in the small species than in the large, displays no constant regularity in this respect, for the sow produces 15 to 20 young at a birth, while the female rat has no more than 5 or 6, a squirrel 3 to 5, a cat 4 to 6, a weasel and an ermine 3 to 5. It is true that the elephant, the hippopotamus and the rhinoceros, those monsters of the animal world, produce only one young one at a time; for Nature would be unable to endure their enormous depredations if she had multiplied their species at the same rate as that of rabbits or rats. Ruminants produce only one young one at a time, rarely two or three. Carnivora bear three or four young at each gestation: rodents are the most prolific of all; monkeys and bats usually produce only one.

Number of Teats. "No quadruped has less than two or more than twelve leats; quadrumana or monkeys, bats, elephants and manatees have two situated on the chest; carnivora, six or eight disposed lengthways on the belly. The rodents have a larger number, but they are visible only at the period of lactation. Birds and echidnæ appear to be without teats. The opussum and the kangaroo have from four to eight in a duplication of the skin of the abdomen, which forms a kind of purse; for these animals give birth at the half-period, and their young, warmly shut up in this pocket, suck the teat there, until they are weaned and in a condition to leave their parents. The mother is careful to make her young go out at times and to shelter them in her inginual pouch at the least danger.

"The Philander of Surinam bears her's upon her back, and they know how to fix themselves to her by curling their long tail round her's.

Lactation. "In animals, lactation is not so long as it is in the human species, because the young ones attain their full growth more quickly. It is asserted that the camel suckles her young for two years. It is almost the same as regards the young elephant. Six weeks or two months may suffice for the calf.

"The other species suckle their young in proportion to the rapidity of their growth; those which have several litters in a year suckle for a very short time only, as rabbits, sows and rats.

Accouplements of Different Species. "A product is often obtained from the accouplement of allied species. Thus the horse and the ass produce the mule, which is not always sterile in warm countries. The buffalo can also engender with the cow, the zebra with the ass, the bison with the cow, the dog with the wolf, the jackal with the fox, and the ram with the she-goat. Authors of high repute declare that they have obtained an issue from the dog and the cat, from the bull and the mare, from the ass and the cow, and even, according to the illustrious Locke, from the cat and the dormouse.

"Others assert that they have obtained a product between the monkey and the human species, but following the example of the Apostle Thomas, we shall believe it when we see it.

Vivacity of Love in Mammifers. "Love is much more keen in mammifers than in other animals on account of the sympathy which exists between the matrix and the mammæ, for there is a great resemblance between the action of the mammary gland and that of the organs of generation; and lactation may be considered in some way as a consequence of sexual accouplement, The excitation of the mammary gland extends to the genital organs, and the erection of the one provokes the erection of the other; for the sensibility of the nipple corresponds greatly with that of the clitoris: this is really one of those secrets of love which may be felt far more easily than it can be explained. The mammæ participate in the pleasure of the sexual union, and that state of spasm is requisite for the secretion of an abundant supply of milk. Mothers secrete more for their own son than for a stranger who makes no impression upon their nervous system. The caresses of the father, or of a person who is loved, augment the secretion; this may easily be observed in the case of milch cows.

"Love therefore is more interesting in mammifers than it is in other animals. We shall study it in the more important species: the mare, the she-ass, the cow, the sheep, the she-goat, the roedeer, the hind, the dog, the wolf, the fox, the squirrel, the dormouse, the hamster, the badger, the beaver, the otter, the mole, the cat, the lion, the bear, the tiger, the whale, the elephant, the rhinoceros, the hippopotamus, the camel, the sow, the hare, and lastly, the rabbit.

The Horse. "When mares are in season, they become very restless, raise the tail, like to approach horses, and neigh as soon as they see them, Their vulva swells for 15 or 20 days and this is the precise time during which accouplement ought to take place. The mount occurs either in freedom, or is effected with the hand. In the former case, the stallion is let loose in a paddock with the mares; this method which is the surest and most natural, has only one inconvenience, that of exhausting the stallion unnecessarily. The best way is to place him in a small enclosure and to let the mares loose successively which he is desired to cover. By thus giving him two a day, and by making them return in succession if they have not conceived, the end is completely attained and the inconveniences avoided. When the mount is effected by hand, the mare is tied by the head and legs and all the movements of the stallion are guided, as though he were incapable of directing himself in this operation, which is so natural to all animals. After the mount, the mare is led back into the stable where she is left quiet for some hours at least, in order that the conception may not be disturbed. One stallion can easily serve twenty or thirty mares during the season, for one accouplement is sufficient for each. Gestation lasts for about a year. Hard or too fatiguing work, blows on the loins or belly, and drinking too cold water will produce abortion.

The Ass. " From the age of two years, the ass is in a state to engender; the female is still more precocious than the male and quite as lascivious. These animals are very ardent for this pleasure; the male becomes furious, so that nothing can restrain him, and he has been known to exceed and to die of it some time after; the older he is, the more ardent he appears, and this kind of fury which accompanies the most considerable apparatus, (penis and testicles), which exists among all quadrupeds relatively to the size of the body, caused the ass in ancient times to be looked upon as a favourite of the God Priapus, by the side of whom he is usually represented.

" She-asses are commonly in season in the months of May and June; those which give signs of it every month in the year are less fecund than the rest; and if they have not been fecundated before they lose their last teeth, they are sterile all their life. Heat is manifested in the same way as in the mare, and gestation lasts for the same period. Seven days after the birth of the foal, the she-ass is in season again, and in a state to receive the male, so that she can, so to say, be continually engendering and bringing up young.

The Cow. "The cow, in our climate, begins to come in season in spring, but she has no regular time, and some do not do so until quite late, in July. All are in a state to produce when they are 18 months old, but the bull cannot engender until he is two years old. The violence of their desires is extreme and their repeated bellowings announce the fires of concupiscence which consume them. The cow leaps upon her companions, upon the oxen and even upon the bulls, and her vulva is then swollen and prominent; bulls fight with fury and the victor becomes the happy lover. He leaps the female with eagerness,—the object of the fight and the prize of victory;—he presses her with ardour and by the impetuosity of his movements compels her to bend beneath the weight of his body. After the cow is in calf, the bull refuses to cover her, and she almost always ceases herself to seek him. Gestation lasts for nine months as it does with a woman.

Sheep. "If the ewes are not fecundated at the time when they begin to come in season, inconveniences may result. Although the ewes come on heat again, a fortnight or a month afterwards, fecundation is not then certain. It has been frequently remarked that when the ram is given to the ewes some time after they have first come on heat, many of them are not fecundated; and it is a matter of general experience that early lambs are always far more vigorous, and above all that they attain a larger size than those which are born later.

"Analogy too supports this proposition: mares, when they have got over their spring heat, often come on in heat again in the summer or autumn. But if they are put to the stallion at the later periods, it is not unusual for it to be unsuccessful; and when they hold, their foals are invariably weaker and not so fine as those which are engendered in spring.

"The time of accouplement is therefore subject to particular circumstances and the rule to be followed is never to interfere with the laws of Nature in this respect.

"When they are six months old, the young rams must be separated from the young ewes with whom they would become enervated and produce a feeble and ill-shaped progeny, which would soon become degenerate. When the leaping takes place, a third flock also ought to be formed, composed of the females which it is not wished to accouple. A ram who has been allowed to exhaust himself for eight or nine months in fecundating a hundred ewes, is no longer fit for reproduction the next year; but if he is not used until the beginning of his second year, he may produce a fine progeny until he is six or seven years old.

The She-Goat. "The she-goat has by nature more sense and resource than the sheep; she comes to man of her own accord, and easily grows familiar. Sensible to caresses and capable of attachment, she is also stronger, lighter, more agile and less timid than the sheep; she is lively, capricious, lascivious and fond of wandering; she is fond of roaming away in solitude, of scaling precipitous places and of sleeping on the summit of rocks and on the edge of precipices; she eagerly seeks for the he-goat, accouples with ardour, and brings forth her young at a very early age; that is to say, after she is seven months old, while the he-goat is unable to engender until he is a year old. But the fruits of this precocious generation are feeble and defective, and it is usual to wait until they are both eighteen months or two years old, before allowing them to reproduce.

"The he-goat, who is very ardent, is able to serve 150 she-goats each season; but this ardour which consumes him lasts for only three or four years. The black he-goat is the best. She-goats are in season from September to November, and even if they are brought to the he-goat at any period, they are soon disposed to receive him, and can accouple and breed at any time; they hold better, however, in autumn, and this period is preferred for mating them, as the kids then find the grass green and tender when they are born. She-goats go with young for five mouths. The he-goat accouples with ewes and produces half-breds with them, differing from lambs only by having a shaggy fleece instead of wool. This progeny is fecund, and bears in America the title of *chabin.*

Roe-deer. "Instead of uniting in herds like red-deer and fallow-deer, roe-deer remain in families, consisting of father, mother and young, and they are never seen to associate with strangers; they are as constant in their loves as the red-deer is inconstant. As the hind usually produces two young at a birth, a male and a female, the young animals, fed and brought up together, become so fondly attached to one another that they never part, unless some cruel fortune separates them; but it is attachment rather than love. Although they are always together, they feel the ardours of rut only once in a year, about the first fortnight in November. They are not savage like the red-deer, but they drive away their fawns, as though to compel them to give place to others which are about to come and to form a family themselves; however, some time after the rut is finished, the fawns return to their mother, and afterwards go away and take up their quarters at a distance from the place where they were born. The hind goes with young for five months and a half; at the beginning of May she separates from the male in order to bring forth her young, hiding herself in the depths of the woods to avoid the wolf, her most dangerous enemy. After twelve days, the fawns are able to follow her, and when any danger threatens, she hides them in some thicket and allows the hunters to chase her.

Fallow-deer. "The fallow-deer is a little smaller than the red-deer and rather larger than the roe-deer. Although red-deer and fallow-deer much resemble one another, they cannot endure one another, and never go together or mingle; they consequently never form an intermediate race. They seek for the female's society from the time they are two years old, but they do not keep to the same one like the roe-deer, but change about like the red-deer. The fallow-deer goes with young for eight months.

The Red-deer. "About the middle of September, the red-deer leave the smaller woods and return to the forests where they begin to seek for the females; they roar loudly, swelling out their neck and throat; they grow restless, crossing the fields by day, butting against the trees, appear wild and savage, and traverse the country in their search for the hinds. It is not enough for them merely to meet them, they must also pursue, constrain, and subdue them, for at first they avoid the stags; the hinds run off, and do not halt until they are weary from the pursuit. The rut first starts in the older ones; the younger ones do not come on heat till later, and if two stags meet they must first fight before they can obtain their enjoyment. If they are of equal strength they threaten one another, paw the ground and roar loudly, then they rush on one another and fight to the death; they give such terrible thrusts with their antlers that frequently they are both killed. The fight only ceases with the defeat or flight of one of the two; the victor does not lose an instant before he enjoys the fruits of his victory and his desires, unless another rival appears. The older stags are always the masters, being stronger and bolder than the younger ones, who are obliged to wait until the field is vacant before they have the hind in their turn. Nevertheless, it sometimes happens that they make the attempt while the older ones are fighting, and after a brief moment of pleasure they run away. The hinds prefer the older stags, because they are warmer and more eager than the younger ones, as well as being more inconstant. They pass in this way from one hind to another until they are completely exhausted.

"This amorous fury lasts only for three weeks, during which time they take neither sleep nor rest, they do nothing but roam about, fight and enjoy themselves: afterwards the stags are so wearied, exhausted and thin that it is a long time before they recover their strength. In years when acorns are abundant they soon recover, and a second rut is then to be observed about November, the first occurring about August the 15th.

The Dog. "From the age of nine to ten months, according to the breed, the dog is capable of engendering. The male can accouple at any time, but the female receives him only at the time of rut, which occurs twice in the year, more frequently in winter than in summer, and which lasts sometimes for a fortnight. Six or seven days after the swelling of the vulva, the female seeks for the male who, for his part, scents her a long way off. One accouplement is sufficient for her to conceive a large number of puppies. When, however, she is left at liberty, she accouples several times a day, with every male who presents himself. It is observable that when she is able to make a choice, the bitch always prefers the largest males, however ill-favoured they may be; thus it often happens that a small bitch who has received a large mastiff, dies in giving birth to her puppies. Like wolves, foxes, jackals and badgers, dogs cannot separate for some interval after the consummation of the act of generation. The reason is as follows: as the dog has no seminal vesicles, he only ejeculates his sperm drop by drop. It is necessary therefore that his coition should be prolonged in order to be fertile. In order that it should last for a sufficiently long time, it could not be left to the mere chance of the animal's will. Consequently, his penis after its introduction into the vagina of the bitch, acquires a considerable size, and erection only takes place after intromission owing to a bone which communicates its solidity to the member. But it is a remarkable thing that it is just at the base of this bone that the penis swells, so that its dimensions considerably exceed those of the vulva which it has previously entered without any obstacle.

'An admirable proceeding, owing to which the animal sometimes terminates with pain, an act which it sought for in the first place, guided by instinct and under the impulsion of pleasure. The bitch carries her young for two months.

Wolves. 'When several wolves are seen together, it is not a peaceful meeting but a warlike assemblage, heralded by fearful howls. As soon as the raid is finished, the wolves separate and return in silence to their solitude. There is not even any great intimacy between the male and the female, they seek for one another's society only once a year and remain together for only a short time. The she-wolf comes on heat in winter; several males cover the same female, and this assemblage is even more sanguinary than the former, for continual disputes arise between them. They growl and moan, fight and tear one another, while the one that is preferred is often torn in pieces, while, like the dog, it is fastened to the she-wolf by its penis in a position in which it is difficult for it to defend itself. Usually the she-wolf runs away for a long time, tires out all her suitors, and steals away while the others sleep with the one which is most active and well-favoured. The young, five or six in number, are born at the end of sixty-three days.

Foxes. "Foxes, in our climate, come on heat in the month of February. They are then heard giving tongue, with different tones, according to the sentiments which affect them. They have a hunting cry, an accent of desire, a murmur, a plaintive tone of sorrow, and a cry of pain, like a dog. The coition is also the same on account of the bone in the penis. The young cubs are born with their eyes closed, like dogs and wolves. Gestation lasts for nine weeks, and the female when in cub rarely leaves her earth, where she prepares a bed for her litter. A great antipathy exists between the dog and the fox. There are instances, though they are rare, of half-breds.

The Badger. "This animal has also a bone in its penis and its accouplement is like that of the dog. Commandant Garnier, a great hunter before the Lord, has found in an adult badger, 12 kilogrammes in weight, a bone in the penis measuring 73 millimètres in length, with a diameter of 6, and expanding at the base to 8 millimètres.

The Philander of Surinam. "But the animal with the most curious genital parts is the philander of Surinam; the gland of the male is forked with two orifices, and the vagina of the female is separated into two branches, corresponding to the horns of the uterus. These animals have no matrix, properly speaking; the inguinal pouch replaces it, like that of the opussum.

Squirrels. "On fine summer nights we hear the squirrels crying out as they clamber up and down the trees, one after another. They seem to fear the heat of the sun and remain during the day in the shelter of their home, whence they emerge in the evening for exercise and play, for love and for food. They begin by carrying up sticks of dry wood into the fork of a tree, these they throw together and intertwine with moss; they make their work large and solid enough to be at ease and in safety in it with their young which number three or four; over the opening is a kind of cone which shelters it all. After this they give themselves up to love, a performance which with them is as elegant as their antics.

The Dormouse. "Like the squirrel, the dormouse dwells in the forests, climbs the trees and lives upon mast nuts and chestnuts. It makes a bed of moss in the interior of hollow trees, and takes up its abode also in the crevices of lofty rocks and seldom comes down to the ground. They accouple towards the end of spring and hibernate during the winter.

The Hamster. "Another very remarkable animal which sleeps in the winter is the hamster, common in the North of Europe. This animal forms a granery and collects there at least 20, and sometimes as much as 100 lbs. of grain. They also devour any animals which are weaker than themselves: their fury is extended so far in fight that the male does not spare even his own female, nor does she the male, if he is weaker than she.

"The marriage of the hamster is the exact image of a divided household and a mercenary agreement among civilized couples. The male and the female at first agree admirably in pillaging the public together; discord arises only when the time comes to divide the spoils, just as it does in a state of civilization. The male who has been happy to utilize the labour of the female in filling his storehouse, just as a husband pockets his wife's dowry, commences at the beginning of winter by reducing the female to a suitable portion, then under some wrongful pretext, he expels her from the conjugal abode. But the female who knows her rights, and the hiding-place where the treasure is deposited, does not relinquish the affair so easily. Obliged to flee before superior force, she digs out a path by the back to return to the spot, and succeeds in carrying off a considerable quantity from the hoard. She does still better, she demands the help of an Ægistheus, and the pair, taking advantage of Agamemnon surfeited and slumbering upon his wealth, strangle and eat him. For it is the hamster's fate to be devoured by his family or by his partner, if he has not the wit to take the initiative."

(Toussenel. *L'Esprit des Bêtes.*)

"In such a species as this we must not expect to meet with sweet affection; the young receive no sign of tenderness from their mother; she drives them from her earth when they are three weeks old. Nevertheless, love changes for a few moments the hard insensibility of the females; when in love, they sacrifice themselves for the object of their passion, whom they defend with fury if anyone tries to take him away from them: it would seem too by this self-devotion that they wish in some way to protect their abode. Bloody struggles, only ending in the death of one of the combatants, often precede these alliances, but while they last the couple lay aside their natural ferocity.

The Beaver. "We find gentler manners among beavers. After employing the months of July and August in constructing their dam and their cabins, they make their provision of bark and wood in the month of September. They then relax from their toil, tasting the pleasures of repose and the pleasures of love. Each pair unites from choice and associates from inclination. They spend the autumn and winter together; content with one another they hardly ever part, and happy in their dwelling they only come out of it to make agreeable and useful excursions, from which they bring back fresh bark.

"The females go with young for four months and produce two or three at a birth. The males leave them towards the end of the winter, go into the country to enjoy the pleasures and the fruits of spring and come back to the cabin from time to time, but do not stay there. The mothers remain there occupied in giving suck, attending to and bringing up their young, who are able to follow them at the end of a few weeks. They go abroad in their turn, and pass the summer on the water and in the woods. They accouply belly to belly, on account of the breadth and thickness of their tail.

Otters. "During the winter, otters keep sometimes in the sea upon the ice and sometimes on the shore; in summer, they enter the rivers and sometimes go up as far as the fresh-water lakes. The male attaches himself to only one female, with whom he goes in company and of whom he seems to be very fond, never leaving her on land or in the sea. They cohabit, apparently, all the year round, for young ones are seen at all seasons, and sometimes a whole family composed of different parties, for the young ones do not leave them until they are fully grown up and capable of forming a fresh family. The females produce only one young one at a time, and very rarely two. Gestation lasts eight to nine months, and the mother suckles her young one for almost a year; she is passionately fond of it, never ceases to lavish care and caresses upon it, and plays continually with it both on land and in the sea. She teaches it to swim and, when it is tired, she holds it in her jaws to give it a few minutes rest. If an attempt is made to take it from her, she gives vent to lamentable cries and groans, defends it with courage and allows herself to be killed rather than abandon it.

The Mole. "Nature has magnificently endowed the mole with a remarkable apparatus of genital organs, all of them hidden within its body and consequently most active and most warm. The penis of the male contains a bone in the shape of a lancet at the middle.

"Moles come into rut in the early days of spring and the keenest ardour animates their union, as well as the most complete attachment to one another. The female is very fond of her young, and prepares for them beforehand a peculiar retreat worthy of the admiration of the greatest architects.

"Moles breed twice in a year. Each individual of the species lives alone, except at the season of love and when a new-born family requires their care. Toussenel has celebrated the amours of the mole in lyrical style.

"His love is an epilepsy....."

"If the ancients had known the mole, it is more than probable that they would have consecrated him to Priapus.... the *God of Gardens*. The mole does not invalidate the well-known saying that Love is blind."

"With regard to blind love, there is here a thing which is very painful to say to man, and excessively delicate to write. I mean to say that if it is true, as science admits, that the speciality of the attribution of a single function to an organ is the characteristic which constitutes the relative superiority in the animal species, man is compelled to take up an inferior position in the scale to that occupied by the mole; seeing that in man there still are organs which serve for two functions.... in the mole this is not so. I must ask not to be obliged to explain myself more fully in this respect, and also to be allowed to pass over in silence the causes of the desperate resistance offered by the young mole to the brutal solicitations of her lovers.

"The mole is the cup of iniquity mentioned in Holy Scripture. Take equal parts of Blue-beard, Louis XV., Messalina and the Marquis de Sade, pound them altogether in a mortar, heat the mixture and distill it, and you will obtain the mole. The mole is the one-eyed Cyclops who burrows in the bosom of the earth and forms subterranean galleries; who murders the lovers of Galatea by stoning them; who lives upon human flesh and finds every orgy insipid in which blood does not flow. Where, save in the hideous Cyclops, shall we find a likeness of the mole who gains possession of his female only after putting all his rivals to death and devouring their still steaming bodies, and then demands from beauty the reward of his exploits?"

(Toussenel, *loc. cit.*)

The Cat. "The cat is much inclined to love and, what is a rare thing in animals, the female appears to be more ardent than the male; she invites him, searches for him, calls him and announces by loud cries the fury of her desires, or rather the excess of her wants: and when the male flies from her or disdains her, she pursues him, bites him and compels him, so to say, to satisfy her, although intercourse is always accompanied by acute pain. The cat, in fact, has the gland of its penis as rough as its tongue, and this causes the female sensations of pain, in order perhaps to moderate the excess of their passion which might be detrimental to the propagation of the species.

"Heat lasts for nine or ten days and occurs only at fixed times, usually twice a year, in spring and in autumn. Cats carry their young for 56 days and produce five or six kittens which come into the world with their eyes closed and with scarcely any ears. As the males are apt to devour their offspring, the females hide themselves, when they are about to bring forth, and when they are afraid that their hiding-place will be discovered, they carry away their kittens to unknown or inaccessible spots, holding them gently by the neck; and thus bearing a burden which is dear to them they walk along with head erect, in order that the kitten may not strike against the ground. The cat takes the greatest care of her young and accustoms them early to flesh, by bringing them mice or birds. Cats are fully grown when they are a year old, and are able to accouple all their life, which may last for twelve years. It is impossible to keep a male cat in at the season when the females are on heat. He often wanders a long way from home and does not return for a fortnight, with his ears torn and his face and body covered with scratches, the bloody marks of his amorous encounters.

"The female cat has an essential antipathy to marriage; she accepts one, two or three lovers, or slaves, but never a tyrant; and, should civilization refuse her the right of free trade in love, she demands it of the wild state and returns to the forest. This is the reason that the size and beauty of the cat are developed when they become wild. The cat has only pitched its tent among us."

(Toussenel, *loc. cit.*)

The Tiger. "What shall we say of the tiger who resembles the cat in every way and belongs to the same tribe? Its love, if we may give this name to the fits of passion occasioned by the want to reproduce itself, do not soften its ferocity; it devours its offspring, and sometimes the mother as well who tries to defend them. The tigress, like the lioness, has four or five cubs at a birth. She is furious at all times, but her rage becomes extreme when she is robbed of her young.

The Lion. "The lioness, like the cat, utters loud cries during accouplement, which takes place in the same manner. She receives the male several times during the same day, and gestation lasts for 108 days. The male's mane does not appear before he is three years old. The lion, when taken young and brought up among domesticated animals, easily grows accustomed to live and even to play with them: he is gentle and caressing to his master, especially when he is young, and if his natural ferocity reappears at times, he rarely turns upon those who treat him well.

The Bear. "The bear is a calumniated animal. A man of a surly disposition is said to 'be a bear,' but this comparison is untrue, at least as regards the little honey-bear of the Himalayas, which is as sprightly, gay and caressing as a dog. Before he enters on his winter solitude, the bear devotes himself to the propagation of his species; the two sexes seek one another's society in autumn towards the end of October. The males often fight with fury, excited by love and jealousy. The she-bears also fight, and even with more violence than the males. When they have paired, these animals appear to be urged by very ardent desires; standing upright, they embrace with transport, hugging one another with their front paws like men. During accouplement, which takes place as it does in other quadrupeds, the male makes very rapid movements, but which are interrupted now and again; he seem to try and prolong his enjoyment, and to impart to it more vivacity. As soon as the female is in cub, she parts from her male and proceeds to form her lair in some solitary place.

"Gestation lasts for 112 days and the number of cubs varies from one to five; the young and the old females usually produce only one. The bear-cubs are not ill-shaped, as has been declared, and their face, which is really rather handsome, does not at all resemble what it afterwards becomes. The mother takes great care of them, prepares a bed of moss, and suckles them until the spring when she leads them about with her and defends them with courage and fury, after making them climb into a tree where she thinks they will be safe.

Elephants. "In the elephant the teats are placed between the fore legs, because the mother draws her own milk with her trunk and puts it into her young one's mouth, at all events in the first few days after its birth. The organ of the male is enclosed in a sheath, like that of the horse, and is hardly visible; but when it is extended, it attains a considerable thickness, though in length it hardly exceeds that of a large horse.

"The elephant is usually content with one female. It has been supposed that his accouplement was effected otherwise than in the rest of animals, because the female's vulva is very far forward under her belly; but he operates without difficulty in the usual manner of animals. A credible observer, who has often witnessed the accouplement of elephants belonging to the King of Cambodia, declares that, in order to receive the male, the female must find a suitable place in which to stand in a sufficiently downward position; what, in addition, renders this very comprehensible, is the situation of the copulatory organs in the two sexes. The search for this place, sometimes difficult to find, has probably given rise to the fable of the existence of modesty in these animals. The male can cover his females as often as five times in one day. The females presses her teats with her trunk, which she then entwines with that of the male as a prelude to their love.

The Rhinoceros. "The female of the rhinoceros, like the elephant, usually produces only one young one at a birth. It appears, that gestation does not extend beyond nine months, while in the elephant it lasts for a year. Like the lion, the male lets out his urine behind, but he accouples in the same way as other quadrupeds. The genital organ of the rhinoceros is proportionate to the size of his body, but it is a curious thing that it terminates in a gland the shape of which somewhat resembles the *fleur-de-lys*;—a curious place for a political emblem! Like that of the hippopotamus and the elephant, the penis is enclosed in a sheath and hardly visible at ordinary times.

The Hippopotamus. "Hippopotami are not ruminants, in spite of their vegetable diet and their stomach with numerous pouches. The males appear to be jealous of one another and fight with fury for their females; they give such terrible blows with their tusks that they often break them. These combats take place on land, but in the water the rivals avoid one another. The females produce only one young one at a birth and gestation lasts for only nine months: their teats are full of milk as sweet as that of a cow. The young suck the milk in the water as well as on land. As soon as they are born they have the instinct to run into the water and swim; the mother often holds them up on her back.

The Camel. "In the camel, accouplement is painful: the female crouches down and receives the male in the same position which she asumes for repose, for sleep, or for being laden. Thence no doubt the etymology of the name of camel given to women who gain their living by letting themselves be ridden in a bed! The male, sitting up behind her like a dog, touches the ground with his two fore-legs; he appears cold during the accouplement and more indolent than any other animal. His genital organ is, like that of the bull, very long and very thin. In the ordinary state, his sheath draws backwards, and he emits his urine like the lion and the rhinoceros. Like the dromedary, the camel goes with young for nearly a year and produces only one at a birth. At the season of rut the camel becomes unmanageable and even furious. It is said that at this period they remember all the bad treatment they have received and try to avenge it. They kick, bite, and try in their fury to crush men beneath their weight.

“We shall best complete our account of the amours of animals by mentioning the prodigious fecundity of the sow and the rabbit.

The Sow. “The sow is almost always on heat: even when pregnant, she stills seeks for intercourse with the male, and if not satisfied, she is seen to be exceedingly disturbed and to wallow in the mire. In these kinds of fits, the sow will suffer the approaches of a male of a different species to her own, such as the dog. It is even declared that these illegitimate amours are sometimes followed by fecundity. A German review gives the detailed description and history of a *dog-pig*. But there is no ground for crediting the existence of such products, and those which are quoted are only monstrosities such as are by no means rare among domesticated animals, and especially among pigs.

“Gestation lasts for four mouths; a short time afterwards, the sow seeks after the boar, and she can thus have two litters in a year. Although she has only twelve teats, never more and sometimes less, she produces often 15 and 20 young at a birth. We are assured that there are instances of sows having given birth to as many as 37 young at a time.

The Hare. “A widely-spread error has existed that hares were for the most part hermaphrodites. This prejudice has originated in some curious peculiarities in the organs of generation: the gland of the female's clitoris is prominent, hard, thick, and ends in a point; it is almost as large as the gland of the male's penis. And as the vulva is not apparent, it is often a difficult matter to determine the sexes.

"These animals, which mutiply very fast, are in a condition to engender at any time; they produce one, two and as many as four young ones, giving birth to them under a tuft of grass or heather, or a small bush, without any preparation. Sportsmen have observed that when there are several leverets in the same litter, they are marked with a star on the forehead, and that this star is wanting in the leveret which has come into the world alone. As soon as the females have brought forth their young, they again begin to receive the male, but they can also receive him when they are with young."

"For, says Buffon, the vagina and the body of the matrix are continuous, and there is no orifice or neck of the matrix as in other animals, but the horns of the matrix each have an orifice which projects into the vagina, and which dilates at the birth; but these two horns are two distinct matrices, separate, which can act independently of one another; so that the females in this species can conceive and give birth, at different times, by each of these matrices, and consequently superfetations must be as frequent in these animals as they are rare in those animals which do not have this double organ. The females, therefore, can be on heat and pregnant at the same time." Very ardent in love, they have no particular season for producing; it is from December to March, however, that the males seek their society the most, and that the greater number of leverets are born. They always come into the world with their eyes open, although Aristotle the philosopher has asserted the contrary. The mother suckles them for 20 days, after which time the young ones separate and find their own food.

Rabbits. "From the point of view of the sexes, the same presumptions have been held about rabbits as with regard to hares; but the real fact is the truly prodigious multiplication of the rabbit. These animals propagate with such rapidity in places which are suitable for them, that it is impossible to destroy them;

and as, during the greater part of their life they are, together with their young, hidden from the eyes of man, much art is required to be employed in order to diminish their numbers, which are often unknown and sometimes formidable. Pliny and Varro relate that a whole town in Spain was destroyed by the incredible number of rabbits which had burrowed under the foundations. Agriculture suffers from their devastations, but the carnassiers, snakes and cats are their deadly enemies.

"Rabbits are able to engender and produce at the age of five or six mouths. The female is far more fecund than that of the hare; she goes with young for one month, produces four to eight young ones, and gives birth *seven times* in a year. She is almost always on heat, or at least in a state to receive the male; and as her matrix is double like that of the hare, she is also able to have a double litter. The male is so ardent and lascivious that he covers his female five or six times in the course of an hour. Their manner of accoupling resembles that of cats, that is to say the female squats on her belly upon the ground, with all four feet thrust out, giving vent to little cries. This is also the mode of lions, tigers and of all the carnassiers of the cat tribe. A few days before they give birth, the females dig out a new burrow, in a zig-zag shape, the end of which they line with hair pulled off their belly, and the young ones are received in a soft and warm bed. During the first two days, the mother never leaves them; she only goes out hurriedly and returns as soon as she has taken her food. Sportsmen therefore who are skilful can distinguish the male and the female when they come out of the burrow. The former displays uneasiness when he finds himself in broad daylight; he goes backwards and forwards to his hole, while the female begins to graze immediately. She suckles her young for six weeks, and does not bring them outside until they are quite grown up. Up to that time the father does not know them, for the female closes the entrance of her abode to him. This precaution is necessary in order in order to prevent the male from biting or strangling the little ones, through jealousy at seeing the mother occupying herself with them. But, at the edge of the hole, the father seems to recognize them; he takes them between his paws, polishes their coat and licks their eyes; and they all avail themselves of his caresses. At the same time, the mother redoubles her care and often becomes pregnant a few days after. This tenderness of the male for his offspring proceeds from his constancy to the female he has chosen and whom he never leaves."

CHAPTER XVI.

THE PLEASURE OF THE ACCOUPLEMENT OF ANIMALS COMPARED TO THAT OF MAN.

Is the Pleasure of Accouplement in Animals of the same Nature as that in Man?—The Pleasure of Love in the Animal Series.—Molluscs.—Androgynes.—The Love of Gasteropodes.—The Accouplement of Snails.—Insects.—Fishes.—Batracians.—Snakes and Lizards.—Birds.—Mammifers.—The Apologue of the Stallion and the Ass, by Rabelais.—Lasciviousness of Monkeys.—Reasons for the Lasciviousness of Monkeys.—Baboons.—Ourang-Outangs.—Maternal Care of Monkeys.—Their Coition.—Modesty of the Females of the Ourang-Outang.—Negresses violated by Gorillas.—Immodesty of the Females of the Baboon.

Is the Pleasure of Accouplement in Animals of the same Nature as that in Man? It is an incontestable fact that animals feel a more or less intense pleasure in accouplement according to their different species. Is this pleasure of the same nature as that of man? Is it more or less keen? These are two physiological questions to which we shall proceed to give a reply.

First Question. 'Yes! this pleasure is of the same nature in animals as it is in man. It is, in fact, produced by similar organs. In thalamic animals, the mechanism of coition is the same as it is in man, and

Tillier, consequently is of the opinion that the phenomena relative to accouplement and the voluptuous sensations which result from it must be studied at the same time.

'As we can more easily take account of the actions of animals in proportion as they are higher in the series and more nearly resembling ourselves, in order to study both the phenomena relating to accouplement, and the sensations which result from those phenomena, we will first look at the most perfect class, that of mammifers, of which our first category—that of perfect accouplement—is almost solely composed.

'In this order, fecundation always takes place in the interior of the mother's body and always necessitates the intromission of the male organ. With one single and unimportant exception, the copulatory organ of the male consists of an erectile penis, formed by the spongious portion of the urethra, and which surmounts two cavernous bodies, the extremities of which are solidly fixed to the branches of the pelvis: the penis terminates in a gland of very variable shape but which is bifid only in marsupials. The copulatory organs of the female are formed of two cutaneous folds, the *labia majora*, of two *nymphae* situated within, which are sometimes wanting, of an erectile organ furnished with a gland: the clitoris, corresponding to the penis, and of a conduit intended to receive the male organ: the vagina.

'In the state of repose, in the male, the copulatory organ is very different to what it becomes at the moment of the union of the sexes. Erectility being, so to say, the peculiar characteristic of the tissues of the penis, this organ may become more or less rigid, increase greatly in size, and change considerably in shape when the animals accouple. These modifications must necessarily be effected a short time before copulation, for rigidity, more or less, is in general indispensable for intromission taking place into the interior of the organs of the female, where the fecundating liquid must be carried. Although the erectility of the tissue may be less marked in the female, and owing to the shape of the parts, the changes occurring before or during accouplement may be less considerable, erection nevertheless exists, and that of the clitoris in particular is perfectly appreciable.

"To sum up, the phenomenon of erection is, therefore, the initial phenomenon which necessarily precedes any accouplement of mammifers. We have not to enter into the details which render erection possible: it is sufficient for us to know that it results, principally, from the affluence of the blood into the cavernous bodies and is the result of the cessation of the action of the vasomotor nerves upon the organs of circulation.

"But if we know, anatomically, by means of what mechanism the phenomenon is accomplished, we are ignorant, or at least we are unable to explain, how the nervous influx acts. We may, at any rate, believe that erection is partly subject to the action of the will, and that it is produced spontaneously when the necessary conditions happen to meet. These conditions, generally speaking, appear to be as follows: in the first place, the presence of the individual of the opposite sex in a state of rut, then the execution of certain movements, which are analogous in many species, and caresses, the repletion and distention of the organs of the male filled with the fecundating liquid, the approach of the time of ovulation in the female, and also an exact concordance between the instants at which the genital excitation is sufficient in both sexes.

"The movements of which we speak often consist in the rubbing of the animals which are about to accouple, one against the other, as if the contact of the bodies must result in a preliminary excitation; frequently too, the male acts more directly upon the female sexual organs, and lastly, the smell, which, as we have seen, plays such a considerable part in the meeting of the sexes, appears, here also, to have a certain importance; for the more or less complete erection of the male is frequently seen to result from the perception, (sometimes at even a considerable distance), of odours emitted by the female.

"Relatively to the other conditions necessary that erection should be produced, repletion of the organs of the male, coinciding, or almost so, with ovulation in the female, somewhat considerable differences necessarily exist according to sex. Indeed, we are met with the following complex fact: a powerful instinct acts upon the male, and the animal knows, even when he has never accoupled as yet, that the females in rut of his own sex can alone satisfy this instinct. But he is at the same time impelled by a physiological want of an imperious kind to emit the seminal liquid with which his organs are filled. The female, on the other hand, is equally impelled by her instinct to receive the male, and although knowing instinctively that he alone can satisfy the desire which she has to accouple, does not experience any physiological want analogous to that of the emission of the semen, this emission being effected perfectly in her case without any accouplement. We can understand that the energy of the want to which the union of the creatures would give satisfaction, may be either greater or at least different in the case of the male, and that erection may be produced in him by the fact of the repletion of the organs, while a more direct action is necessary in the case of the female. Therefore it is not an uncommon thing to see males trying to accouple when the females refuse them, and even, at least among our domesticated animals, we may observe a state of complete erection when no females are present.

"However this may be, when the rigidity of the male organ is sufficient, and the sexual excitation in the female has reached its limit, the sexual union is accomplished. Except in marine species and a certain number of rare animals, regarding which many observations remain to be made, the respective positions occupied by the males and the females in the genital act are known to us. These positions, which it is unnecessary to describe, are in principle and with some few exceptions, always the same. Never, save in extremely rare exceptions, do any fixatory organs exist; but the anterior members of the male, or his mouth may serve him to keep the female in her position. For intromission to be possible, the females must often assume characteristic attitudes, very different to those which they ordinarily have, attitudes with which the younger animals are quite as well acquainted as those which have accoupled several times.

"Relatively to the duration of the act, great differences exist according to species. As we have had occasion to say, when treating on accouplement in general, we know how the absence or the presence of the seminal vesicles, of the penial bone, the length of the deferent canals, etc., may play an important part in the rapidity of the flow of the male liquid. Thus we see in many mammifers that when intromission is complete, a very short period is enough to produce the emission of the male liquid, while in others it seems that repeated rubbings of the male organ along the walls of the female organ are indispensable, and that in others again the emission of the fecundating liquid is slow enough for the animals to necessarily remain attached to one another for a long time.

"In all cases the contact of the penis and of the clitoris is complete, and this contact seems to have for result the more perfect erection of the female apparatus." (Tillier, *loc. cit.*)

According to the author, these observations apply to all mammifers, and to birds of large size, (ostrich, etc.), whose copulatory organs are similar to those of mammifers. Lastly, but with some differences, they apply to other forms, (reptiles, saurians), in which accouplement is almost complete. These differences consist principally in the union of the sexes being of very long duration, without there being any rubbing of the organs one against another after intromission.

Erection also takes place by means of a different mechanism; the cavernous bodies of the penis are replaced by simple fibrous bodies, and, sometimes too, the penis may assume the shape of grooved bags divaginating before copulation. But, as the clitoris, although somewhat rudimentary at times, always exists in the female, we ought, says Tillier, "to include all these forms in the category of species in which accouplement is perfect, and consider, as being applicable to them, though to a less degree, what we have to say regarding the pleasure in the sexual union.

"When we observe, in the case of superior animals, the attitude of individuals when accoupled, and when we study the expression of their physiognomy, it is impossible to doubt that an intense general excitation results in both sexes from the contact of the organs, that the maximum of this excitation coincides with the emission of the fecundating matter, and that a more or less marked condition of prostration and fatigue follows at the termination of the act. The sensations experienced by the two individuals are evidently very agreeable while they are at the same time very keen.

"We cannot feel any surprise at this, for it is very evident that the satisfaction of an imperious want must cause the whole organism a sensation of pleasure. But, for the highly organized forms which are here in question, the sexual pleasure does not seem to result wholly and simply from the satisfaction of a want, and we shall try to show that the nervous excitation must play a perhaps important part in fecundation.

"We know that whenever an erectile penis exists in the male, a more or less developed clitoris exists at the same time in the female, which may be considered from the anatomical and embryological point of view as an analogue of the penis. This latter organ, in fecundation as it is now performed, is absolutely indispensable for intromission, and, consequently, for reproduction: the clitoris, on the other hand, may be considered as being almost, if not wholly, useless in the mechanism of accouplement. We may therefore, up to a certain point, admit that it is the result of a transmission to the female sex of a characteristic acquired by the male sex. But, in the penis itself the glánd also appears not to be indispensable to intromission, and yet it seems to be the principal seat of the sensations of pleasure felt by the male during copulation, the clitoris filling the same part in the female. According to the very principles of evolution, in order that the gland and consequently the clitoris, both of them of little use in the mechanism of generation, should be developed as organs of genesic sensations, these sensations must play some part in the result to be obtained, namely fecundation.

"If, however, we see that virgin animals are less eager to accouple than those which have already reproduced, we might believe that the organs of pleasure, the seats of sensations in previous unions, exist for the purpose of impelling the creatures to fresh unions. But we observe nothing of the kind, and only one explanation remains to account for the appearance of the clitoris and the gland, as organs of pleasure, and their sometimes considerable development. This is that the sensations which are experienced react upon the organs, and that the erection, the secretion and the cuission of the products are more perfect and more assured than if these organs of pleasure did not exist.

"In fact, artificial fecundation, in which no nervous action intervenes, is possible in mammifers; but the experiments followed by success, do not serve to demonstrate that impregnation, obtained merely by the bringing of the elements together, has been as complete as regards the quantily of semen emitted and of ovules fecundated, as it might have been under normal conditions, while failures have been frequent enough to lead to a belief, if not in the necessity, at least in the utility of the sensations felt during accouplement. It must be observed besides that the males have often been sacrificed, or otherwise operated on, so as to obtain all the fecundating lequid. This question, undoubtedly, like all those having to do with the complex actions of nervous matter upon the organs, is very obscure. A certain light, however, is thrown upon it, if we group together certain generally known facts, upon which, from other points of view, we have had frequently to insist in the course of this work. Thus we know that many males fight together to the death for the possession of one female; we know also that some among them, when they cohabit with females try to devour their young in order to bring about a fresh period of rut, and, consequently, fresh accouplements; we are acquainted with the extraordinary jealousy of the old males; we may have observed, in certain cases, vicious deviations of instinct leading males to accouple with females not belonging to their own species, or even trying by unnatural means to obtain emission of the semen; they have been seen to crowd around a dead female: others are able to enter on erection apart from the presence of females, and the latter, when deprived of the males, sometimes assume the attitudes which they should take during accouplement; lastly, the state of general depression and prostration, of a more or less marked character which follows the union of tho sexes is almost always easy to be observed.

"Moreover, when castration has been incomplete and the gland and clitoris remain, the desire of uninon does not altogether disappear. To sum up: — it is difficult therefore not to ascribe to the sexual pleasure a certain importance in the phenomena which relate to accouplement in the superior animals, and, reflecting upon this subject, we find hardly any other reasons for the existence of a special pleasure than the importance which this pleasure may have for fecundation."

(Tillier, *loc. cit.*)

Tillier then descends from the species with perfect or complete accouplement to the other classes of the animal kingdom. We shall not follow him in the developments which he gives of the accouplement of inferior animals, for it would be merely a repetition of the details given in the preceding chapters. He succeeds in demonstrating that though they do not generally have either penis or clitores, the pleasure still exists and has a real importance with regard to fecundation.

His conclusions are as follows:

"To sum up:—it results from the details into which we have just entered with regard to accouplement in the series, that the animals which have the lowest place in the scale very probably experience, in the act of reproduction, sensations analogous to those which are felt by them in the simple satisfaction of a want, that the nature of these sensations gradually changes, and that in highly perfected organisms a special pleasure, which undoubledly is very keen, accompanies the instinctive satisfaction of the want to reproduce. It may also be believed, though with a less degree of certitude, that the pleasure thus experienced reacts upon fecundation so as to render it surer and more complete."

From Tillier's absolutely irrefutable argument, let us bear in mind the scientific law that the sexual pleasure progressively increases in proportion as we ascend in the animal series, and that the most perfect animals are those which enjoy it the most.

We may conclude from this that man must have a pleasure superior to that of the rest of animals. This is what we shall proceed to demonstrate, selecting characteristic examples, and starting from the common oyster, arrive at last at that superior Primate, of whom a Latin poet has said:

Os homini sublime dedit.

The Pleasure of Love in the Animal Series.

Molluscs. Although the ancients made Venus to spring from the bosom of the waves, and dedicated to her the marine shell-fish possessing two sexes, such as conches or *bivalves*, and *univalves* which also are androgynous, these emblems of pleasure do not prove that the pleasures are as keen in hermaphrodite molluscs as they are in animals of separate sexes. The androgynous molluscs, each of whose sexual organs is removed and cannot accomplish fecundation in the same individual, seek for a third: on this account the *lymnaei stagnales, limosae*, etc. having the female organ at a distance from the male part, cannot be fecundated by the individual whom they fecundate, as the other hermaphrodites do, but they fecundate a third individual, so that these animals unite together in long chains, each one of which receives and hands on the pleasure to its neighbour. Biphores, (salpa), join together, as it appears, in the same way in such considerable masses that Forskahl has seen them extending more than 40 leagues in the Mediterranean. The Marquis de Sade never dreamt of such an application of his extravagant theories. If the pleasure is double, like the organs, in hermaphrodite races, it will be allowed that these associations of molluscs in generation present a spectacle worthy of the cradle of Venus Anadyomene.

The Loves of Gasteropodes. Snails and almost all Gasteropodes, although hermaphrodites, nevertheless need to accouple, and fecundation, in these incomplete androgynes, is only effected in consequence of the voluptuous sensations for which they are indebted to the double hymen which unites them.

The Accouplement of Snails. Swammerdam has published all the details of this singular generation in snails. "In these animals the spermatic vessels occupy not only the anterior part of the neck, of the chest and of the belly, but they also extend to the extremity of the spiral of the liver. In order to see them perfectly, it is necessary to cut the skin and the muscular plane which extends over the stomach and over the organs of generation. The penis and the oviduct are so joined together that they have several parts in common.

"The penis is of considerable extent, is imperforated, and terminates in an elongated ball. This organ does not usually appear externally, but projects at the time of coition, slipping with great facility into a kind of sheath which serves to envelope it and which has the function of a very prolonged prepuce. If the penis is cut during accouplement, there only remains to the animal this sheath out of which its genital member has gone and is unrolled outside.

"The *testicles*, or the melt, displays itself in the shape of oblong filaments, sixty-six in number, according to Swammerdam. Their deferent canal communicates with the oviduct. The latter is of considerable extent. The ovary is of an elongated shape. The part which Swammerdam has named the *uterine appendix*, is a small entrail in which works the crested and *enciformed* dart, the *jet* and the wound of which form the preludes of accouplement. Thus organized, snails accomplish their double union. *Mutuis animis amant, amantur*. A few days before, they assemble together, indulge in gentle quietude and eat very little. They place themselves in such a way that the head and neck are reared upwards. The orifice of the parts of generation, which are situated on the sides, dilates from the neck and appears agitated with spasmodic movements. The future conjuncts approach one another gradually, and indulge in preliminary enjoyments and in details of pleasure clearly evidenced by the tremulations of the tentacles. The one which has been affected the most by these preludes, then puts forth his enciformed shaft and with it penetrates his companion who, in his turn, unfolds the benificent dart with which he is armed. All these preparations last sometimes for several days. The pair devote this time to gradually exercising their sluggish sensibility and to pushing out all the apparatus of their generation. At this period, the double marriage is at length consummated, and undoubtedly by the mere influence of the voluptuous sensation which, in each of the pair, produces the detachment of the germs and the emission of the principle which must fecundate them. During the time of accouplement, every agitation of the penis can be followed through the transparent coats of the conduits in which they are received.

"The reproductory organs do not return into the body of the animal as soon as accouplement is ended.

A quarter of an hour at least is necessary for the turgescence and erection of these parts to diminish sufficiently to allow them to retreat." (Swammerdam. *Biblia Naturae*).

How many mortals would be happy to possess the complete hermaphrodism of snails!

Insects. In animals of separate sex, love displays impetuosity in proportion to the amount of the separation and of the obstacles to pleasure; puberty in them becomes stronger. It must be so especially among those frail races which, having only one accouplement in their life, consume in a few instants all the force which animates them. Such is the case with metamorphic insects; they rush to it with such fury that females of the *mantis religosa* and of the grasshopper have been seen to devour completely the head of their males without the latter being deterred for accomplishing, with these cruel wives, the wish of nature.

Many females of other species are to be met with, pursued and overwhelmed by a great crowd of males, who fall dead through the excess of their enjoyments; bumble-bees even abandon their genital parts, which are left inside the queen-bee; it appears that the latter enjoys several of them, like a seraglio of males, in one hive. The Arachnides, although so hostile mutually that they devour one another, lay aside their ferocity in their singular intercourse. Crustaceans, having a double penis, their females also display two vulvæ or ovary orifices at the base of the corselet, so that accouplements can only be effected in front.

Fish. Although fish are fecund, their manner of cohabitation without sexual union, (with the exception of the pseudo-viviparous kinds, blennies, dogfish, etc.), recalls as regards the males the idea of the sin of Onan, when they fecundate the eggs which have already been laid by squeezing out their melt upon them. Moreover, the males of the chondropterygians, (rays), having a kind of feeler, (retinacula), to subjugate their females when they accouple, the latter would not appear to be very ardent, as in all species in which the males need to use violence in order to make them yield.

Batracians. We have described the coition of toads and frogs where intercourse lasts for several days: the males appear so absorbed in their enjoyments that their thighs have been burned and cut without causing them to relax their hold; nevertheless, there is no penis, or intromission. The females have more self-restraint; they operate like other females which kill the males of their species, especially among insects. It is true that we have quoted from Brehm, instances of females of toads being suffocated by the terrible embraces of the male. But it is not generally known that the male incurs the terrible danger of being asphyxiated by the putrid exhalations of his amours. "The amorous intercourse of the toad, (Bufo), with his female is very dangerous for him; he is a long time in his accouplement, and his female, being excited, exhales through all her pores the venom which issues from her pustulus. The male, plunged in this pestilential aroma which he inhales through his mouth and nostrils, falls all at once into epileptic convulsions of the most violent and frequently deadly kind." (1) I confess that whenever I have read this statement, it has always caused me to think! How many lovers of the human species are disgusted by the smell of the fetid breath of their inamorata and fall back in good, (or bad), order. How they would run off at full speed, if the smell of the lady were laden with death! Unfortunate toad who dies a victim to conjugal duty, a victim whom no one laments, not even Mrs. Grundy herself!

The Spider. But the extreme limit of assiduity in love is displayed by the male spider, who presents himself at the entrance of the female's web, makes one pace forward impelled by the fires of concupiscence, and is ready to take two backwards if he is ungraciously received. For the poor fellow hazards his life on the venture, and runs the risk of being devoured by the female ogress whom he tries to seduce. Just as if some Romeo, scaling his mistress's balcony and in the midst of his love duet, (trying to make the nightingale sing, as Boccacio says), were to receive a death blow at her hands, and be transferred into her all-receptive stomach in a meal.

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(1) *Epilepsie et la rage chez l'homme et les animaux.* Laville de la Plaigne. Bayonne, Veuve Lamaignière. 1864.

This would completely disgust you with the game, and Abelard, losing all his prestige, would no longer to be paragon of ill-fated lovers.

Snakes and Lizards. We have stated that snakes and lizards have a double penis or furcation to penetrate into each ovary, and that their intercourse appears to be very lascivious, for they intertwine for a considerable period; that of the turtle, which has only one simple penis, being especially languishing and prolonged.

Birds. Birds, at first sight, appear to be better apportioned than man in the matter of love. No to speak of the *gallinacae*, such as domestic cocks, peacocks, and male partridges, who are able to satisfy a numerous seraglio of females every day, the sweet intercourse of pigeons and turtle-doves has always been celebrated, and writers have gone into raptures over the incredible ardour of the sparrow who can tread his female twenty times in an hour.

Nevertheless, all this lust does not perhaps offer pleasures proportionate to the great number of acts; pleasure undoubtedly exists, as Tillier has shown, but in the first place the penis of birds being only a short tubercle, there is no intromission. The only exceptions are ducks, geese, swans and ostriches, which have a longer penis. In the next place, these frequent copulations produce only imperceptible emissions of sperm, so that they fatigue the male less than they would in the case of mammifers, but doubtless do not afford so keen a pleasure; birds therefore appear to have their enjoyment more in detail and with less intensity, a combination which must have greater advantages in keeping the sexes more closely fixed together among these volatile races.

Mammifers. On the whole, therefore, mammifers appear to feel more completely the frenzy of love. In the female, there is always a clitoris, and in the males a penis, often provided with a bone, as it is among many of the carnassiers, or even with a furcation, as in certain of the marsupials. We know that the copulation of the dog, and of animals which possess the penial bone, is very prolonged, while that of the cat whose gland is covered with papillæ, imparts frantic convulsions to the she-cat.

Many species among rodents, (rabbits, hares, rats, etc.), are subject to superfetation. Lastly, no one is unaware of the fact that nature inspires monkeys and other mammifers which have, *like man*, a penis non-attached by a sheath to the abdomen, with a furious lust which impels them to onanism, if they are unable to obtain accouplement. We see therefore that Nature increases the inclination for love and augments the means of enjoyment in proportion as we go up in the animal scale and reach the human species.

This force of the physical pleasure of coition in animals has furnished Rabelais, in Pantagruel, Book V, Chapter 7, with the material for the apologue of the Stallion and the Ass, during the stay of the worthy Pantagruel and the learned Panurge in the Isle Sonnante. Rabelais has selected the ass, so dear to Priapus, because, as our readers are aware, it is one of the most lustful animals in creation.

It was therefore more qualified than any other to give its opinion upon such an important subject.

How Panurge, relates to Master Æditus the Apologue of the Stallion and the Ass. "At the fair Panurge said to Æditus: Master, be not displeased if I relate a right joyous tale of what happened in the country of Chastelleraud three and twenty moons ago. The groom of a gentleman was exercising his great horses one morning among the fields: there met he a right gay shepherdess, who, beneath the shade of a wood, was watching her sheep, together with an Ass and some goats. Accosting her, he persuaded her to mount behind him on the pillion and visit his stables, where he would offer her good cheer in rustic fashion.

"While they were conversing, the Horse addressed the Ass, and said in his ear, (for all beasts talked that year in divers places): 'Poor, wretched ass, I have pity and compassion on thee. Severely dost thou labour every day. I perceive it by the galling of thy sides: 'tis right that it is so, for God has made thee for the use of men. Thou art verily an ass. But to be also beaten, thrashed, cudgelled and fed as I see thou art, that seems to be somewhat tyrannical and beyond all reason. Thy coat is all staring and ragged, and thou only eatest rushes, and briars, and hard thistles. This is why I bid thee, Ass, to quicken thy little pace to mine, and to come and see how we, whom Nature has formed for war, are treated and fed.

"'In truth, I will go very willingly, Master Horse.'

"Said the Stallion: 'I am Master Stallion for thee, Ass.'

"'Pardon me,' replied the Ass, 'Master Stallion, we village rustics speak but incorrectly and without learning. I will obey you willingly, and will follow you afar off, as I am afraid of blows with which I have had my hide well laced; since it pleases you to do me so much kindness and honour.'

"When the Shepherdess mounted, the Ass followed the Horse with full resolve to have a good feed when he reached the stable. The groom observed him and bade the stable lads to treat him to the fork and cudgel him soundly. The Ass, hearing these words, commended himself to the God Neptune and began to scamper off at a great rate, thinking to himself: 'It is not for those of my estate to follow the courts of great Lords; Nature has formed me to be a help to poor folk. Æsop has warned me by a fine fable that this were presumption on my part, and my best plan is to scamper off as fast as I can go.'

"Then the Ass began to trot, gallop, jump and kick.

"The Shepherdess seeing the Ass being flogged, said to the groom that he was a good beast and prayed that he might be treated otherwise, or she would depart without coming in. Then the groom said that the horses should have no hay for a week, rather than that the Ass should not have his fill. The hard thing was to call him back, for it was in vain that the lads flattered him and called to him: 'Hey! Neddy!'

"'I will not go,' said the Ass, 'I am ashamed.'

"The more lovingly they called him, the more fiercely did he kick, and jump, and bray. They would be doing so still, had the shepherdess not advised them to hold some hay in the air as they called him. This was done; and the ass turned round his head, saying: 'Hay: *adveniat*, but not the fork!' And so he came to them singing melodiously, as well you know who have heard the voice and music of the beasts of Arcadia.

"When he arrived, he was taken into the stable near the great horse, was rubbed, combed, curried and littered with fresh straw up to his belly, with a rack full of grass and a manger of oats, which, when the stable lads did sift he rubbed them with his ears, to signify to them that he could eat it very well without being sifted, and that so much honour was not fit for him.

"When they had fed their fill, the Horse questioned the Ass, saying: 'And now, poor Ass, how art thou, and what thinkest thou of this treatment? Wouldst thou not wish to come again? What sayest thou?'

"'By the fig,' replied the Ass 'which as one of our ancestors was eating killed Philemon with laughing, this is fine indeed, Master Stallion. But this indeed is only half good cheer. Do not you Stallions leap at all in here?'

"'What leaping dost thou speak of, Ass,' asked the Horse? 'Thy manners are bad: dost thou take me for an Ass?'

"'Ha! Ha!' replied the Ass, 'I am a little hard in learning the courtly language of horses. I ask if you, Master Stallions do not do any leaping of mares in here?'

"'Hush!' said the Horse; 'for if the lads hear it they will belabour thy hide with their forks so soundly, that thou wilt have no inclination for leaping. We do not dare to shew merely the end of it here, even to urinate, for fear of being beaten: rest quiet as the Kings do.'

"'By the pack which I bear!' said the Ass, 'I renounce thee, and say away with thy litter, away with thy grass, away with thine oats! give me the thistles of the fields, since there one can leap at one's pleasure: to eat less and to leap as I will, is my motto. You should see, Master Stallion, when we hold our provincial chapter, how we leap while our mistresses are selling their goslings and chickens. I have said.'

"Such was the tale of Panurge, and no other word said he. Pantagruel admonished him to continue. But Ædituus replied that a good listener needs only one word: 'I well understand what you would say and infer by this apologue, but you are shameful. Know that there is nothing for you here, and speak of it no more.'

"'I have seen here,' said Panurge, 'an Abbess in white arranged, who would rather leap than lead in hand. And if the rest appear to be quiet does, she would not seem to be a quiet doe. She seemeth to me fresh and fair, and well worth a sin or two. But may God forgive me, for I thought no ill: the ill that I thought may come to me full soon."

The Lustfulness of Monkeys. Rabelais has not mentioned the monkey, natural history being at that period still in its infancy. He might have selected it as his model with more propriety than the ass. Of all animals the monkey is the one which has the greatest corporeal affections, and they surpass those of man. Its greediness is extreme, and its lustfulness surpasses all that the most unbridled licence of manners could produce. Moreover, the conformation of its sexual organs is similar to that of man; it accouples in the same way as he, and, like him, at any time, because in the countries which it inhabits it finds abundant food at all seasons. This need for physical love, which is so imperious in monkeys, is undoubtedly the cause of their semi-social existence, because the sexes always keep together and form among themselves a kind of phalanstery; but as monkeys are not purely monogamous, and as the two sexes mix together indifferently, according to circumstances, its follows that these numerous temporary connections establish a society, by introducing a veritable relationship.

Undoubtedly, the only foundation of this society is a purely physical affection, but it is none the less true that this horde of monkeys which hold one another more or less by the tail, displays bonds of solidarity analogous to those of a tribe of Australian savages. The hunt together and share what they capture, *the females are respected*, and the male monkey does not make the femal work and enjoy the fruit of her labour, as the Kanaka does.

In my younger days, now over thirty years ago, in 186.., I used sometimes to go monkey-shooting in Cochin-China, on the banks of the Cambodge, where large apes were to be found, with a yellow body and a black face, over a mètre in height. It was a pitiable spectacle. As soon as a monkey was wounded with a gun-shot, he uttered loud cries of pain; the rest of the tribe would come at full speed to the tree, examine the wound and give vent to cries of fury and hatred, shaking their fists at us, and replying to our deadly lead with broken branches, which they hurled upon the roof of our junk. I shall remember all my life how a wounded she-monkey once happened to fall down with her little one in her arms. We had the greatest difficulty to induce one of our Annamite oarsmen to jump into the water and go and fetch the she-monkey. He had scarcely touched her before a large ape came suddenly down from the tree, jumped on the man's shoulders, seized him in his fore-arms by his long hair, while he almost strangled him with his feet. It was impossible to fire at the animal for fear of hitting the Annamite, and in order to rescue the latter we had to send the other oarsmen to drive off the animal with sticks.

The female died on board, clasping her little one, six weeks old and still suckling, in her arms. It was a she, and I was obliged to give her to a watch-dog, whose history I have related in a previous volume, to bring up. Jacqueline, over and over again, after a good meal, would provoke the dogs and even the Annamite boys to amorous intercourse.

Effect of Civilization upon Love. The effect of civilization is to augment the affections of love and benevolence, and the more that manners grow polished, the greater is their tendency to corruption. But as we are not purely material creatures, the mind becomes progressively developed and enlightened, and the moral affections are extended in proportion as the body acquires more sensibility.

In beasts, on the other hand, the material part being preponderant, the social state has hardly any influence except on their physical part. Our domesticated animals also, having to some extent a share in human society, become warmer in love than the same species in a wild state; their sexual organs are far more developed and far more active. The more intimate this association among all creatures, the more is amorous ardour strenghtened; the result of this is that being extreme in certain nations, it is natural that their morals become depraved, and that the physical relations soon prevail over the moral sentiments, especially in very hot climates.

Reasons for the Natural Lustfulness of Monkeys. This, again, is the reason why monkeys, whose temperament is warm, have such ardent passions, inasmuch as the heat of the climate and the close intercourse of the sexes predisposes them to enjoyment.

It is the sense of touch above all, by its delicacy and the vivacity of its impressions, which most enlivens the sense of love; and we see that dull animals whose hide is thick are also the least amorous. Monkeys, being of all animals the best shaped for the use of touch, having four hands and many parts of their body bare of hair, as, for instance, the breasts, the face and the sexual parts, it is not extraordinary that they should be unusually lascivious. Therefore the males and the females kiss one another very tenderly; it is well known that they pollute themselves like men, even in public, and especially when a female approaches them. This action has been taught them by Nature in order to moderate their ardour and to rid them of a luxuriant humour, the excessive abundance of which might be hurtful to them.

The Baboon. The baboon, especially, is insolently lewd and affects to satisfy himself alone before the eyes of everybody. This animal appears besides to be endowed with every vice. His buttocks are completely bare, of a blood-red colour; he seems to make a parade of his nudity, presenting his hinder part more frequently than his head, especially when he sees any women, for whom he displays such effrontery as could only spring, according to Buffon, from the most immoderate desire.

Ourang-Outangs. All monkeys, it is true, do not descend to this excess of turpitude, and ourang-outangs are the most reserved. But this passion for women which is so unbridled that it even leads these shameless creatures to offer them violence, can only proceed from a great similitude of the species, since animals do not join in these adulterous mixtures unless they are near akin and belong in some way to the same natural family. In fact, the propagation of animal affections cannot be effected except among analogous races, and we know how closely we draw near to monkeys in our corporeal faculties.

Monkeys, nevertheless, are essentially formed to climb trees and not to stand upright, like man; but their penis resembles that of man, and their matrix to that of woman. Some females of the large kind have their menstrual discharges, and *all, just like women,* suffer the approaches of the male during gestation. And if, as is reported, the period of gestation in ourang-outangs lasts for seven mouths, it should not be impossible to obtain *men-monkeys,* particularly by selecting small and lascivious races of men, like the Annamites. Such halfbreds, if it were possible to obtain them, would be of great use, for by the study of their intelligence, it might be possible to arrive at great discoveries in metaphysics and in the knowledge of man.

Maternal Care of Monkeys. Their Coition. She-monkeys carry their young in their arms or on their back like negresses; they give them the breast, kiss and amuse them, and sometimes slap them when they are dissatisfied with them. The males of the larger species are monogamous and take care of their young and of the females. In addition, their organs of generation having the greatest resemblance to those of the human species, their coition is performed quite naturally in the same way as in man, belly to belly. It is preceded by lively caresses and even by lascivious kisses.

The large apes are of a more reserved and reflective nature than the other kinds. The small monkeys are lively, petulant and with a great inclination to destroy things. Dog-faced monkeys and magots are indocile, mischievous and rough in their manners; baboons are brutal, intractable, with filthy and repugnant desires. The intelligence of monkeys in general is hardly greater than that of docile and well-trained dogs, but their dexterity is greater, because they are more advantageously shaped.

Modesty of Female Ourang-Outangs. The Ourang-Outang of Java has more gravity and intelligence than